

# ● Analysis Report

## Bruker IVD<sup>®</sup> Lipoprotein Subclass Analysis B.I.LISA<sup>™</sup>

Sample ID: Jan18-2021-nmrsu\_expno500.100000.10r

Measuring Date: 18-Jan-2021 21:11:49








Reporting Date: 18-Jan-2021 22:16:45, 8 page(s), Version 1.0.0

Model Version: PL-5009-01/001

### Disclaimer



RESEARCH USE ONLY: This is no clinical diagnostic analysis report. Must not be used for clinical (medical or IVD) diagnosis or for patient management! Additional concentration range information (95% range of model) provided numerically or graphically in this report must not be used for clinical diagnostic interpretation.

### Main Parameters

| Key  | Parameter | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|-----------|-------|-------|--------------------|---|
| TPTG | TG        | 78    | mg/dL | 53 - 490           |  |
| TPCH | Chol      | 163   | mg/dL | 140 - 341          |  |
| LDCH | LDL-Chol  | 82    | mg/dL | 55 - 227           |  |
| HDCH | HDL-Chol  | 69    | mg/dL | 35 - 96            |  |
| TPA1 | Apo-A1    | 161   | mg/dL | 112 - 217          |  |
| TPA2 | Apo-A2    | 32    | mg/dL | 24 - 48            |  |
| TPAB | Apo-B100  | 63    | mg/dL | 48 - 160           |  |

(\*) Gray horizontal boxes represent 95% range of model, black vertical lines represent sample value.

### Calculated Figures


| Key  | Parameter         | Value | Unit | 95% Range of Model | Graphics (*)  |
|------|-------------------|-------|------|--------------------|---|
| LDHD | LDL-Chol/HDL-Chol | 1,19  | -/-  | 0,98 - 4,08        |  |
| ABA1 | Apo-B100/Apo-A1   | 0,39  | -/-  | 0,30 - 1,07        |  |

(\*) Gray horizontal boxes represent 95% range of model, black vertical lines represent sample value.

## Concentrations of ApoB carrying Lipoprotein Particles (calculated)




Concentrations of VLDL, IDL and LDL particles are calculated from respective Apo-B100 concentrations compiled in the this report taking into account that each VLDL, IDL and LDL particle carries one apolipoprotein B100 molecule, only.

### Total Concentration of ApoB carrying Particles

| Key  | Parameter             | Value | Unit   | 95% Range of Model | Graphics (*)  |
|------|-----------------------|-------|--------|--------------------|---|
| TBPN | Total Particle Number | 1142  | nmol/L | 876 - 2908         |  |







(\*) Gray horizontal boxes represent 95% range of model, black vertical lines represent sample value.

### Lipoprotein Main Fractions

| Key  | Parameter            | Value | Unit   | 95% Range of Model | Graphics (*)  |
|------|----------------------|-------|--------|--------------------|---|
| VLPN | VLDL Particle Number | 102   | nmol/L | 50 - 473           |   |
| IDPN | IDL Particle Number  | 46    | nmol/L | 36 - 316           |  |
| LDPN | LDL Particle Number  | 949   | nmol/L | 760 - 2560         |  |

(\*) Gray horizontal boxes represent 95% range of model, black vertical lines represent sample value.

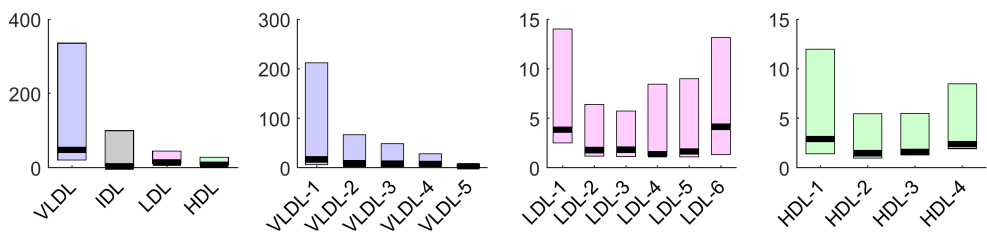
### LDL Subfractions

| Key  | Parameter             | Value | Unit   | 95% Range of Model | Graphics (*)  |
|------|-----------------------|-------|--------|--------------------|---|
| L1PN | LDL-1 Particle Number | 147   | nmol/L | 98 - 567           |  |
| L2PN | LDL-2 Particle Number | 145   | nmol/L | 47 - 427           |  |
| L3PN | LDL-3 Particle Number | 109   | nmol/L | 51 - 499           |  |
| L4PN | LDL-4 Particle Number | 83    | nmol/L | 77 - 577           |  |
| L5PN | LDL-5 Particle Number | 157   | nmol/L | 86 - 615           |  |
| L6PN | LDL-6 Particle Number | 316   | nmol/L | 91 - 815           |  |

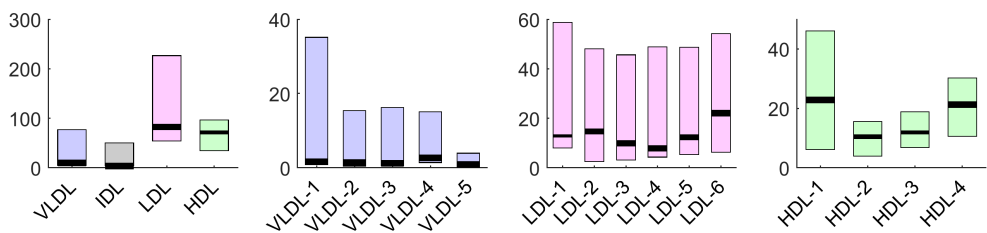
(\*) Gray horizontal boxes represent 95% range of model, black vertical lines represent sample value.

## Lipid Distribution Overview

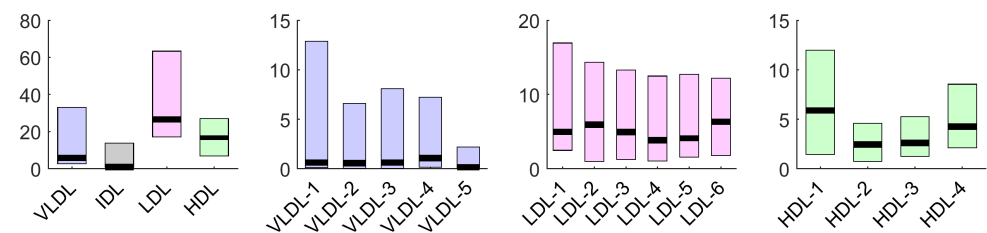
**Triglycerides distribution** (concentrations in mg/dL together with 95% range of model)



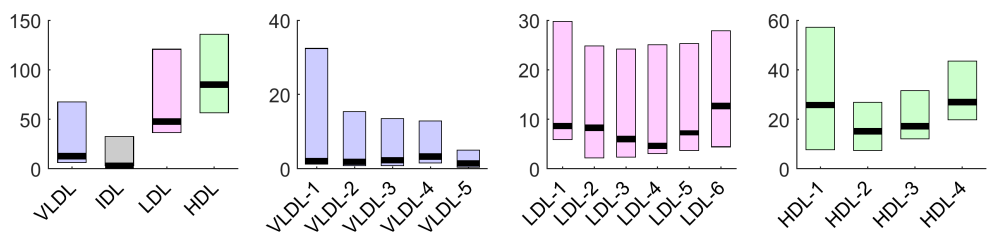
**Cholesterol distribution** (concentrations in mg/dL together with 95% range of model)



**Free Cholesterol distribution** (concentrations in mg/dL together with 95% range of model)











**Phospholipids distribution** (concentrations in mg/dL together with 95% range of model)











## Lipoprotein Main and Subfraction Composition Tables


### Lipoprotein Main Fractions


| Key  | Triglycerides | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|---------------|-------|-------|--------------------|---|
| VLTG | VLDL          | 48    | mg/dL | 21 - 336           |  |
| IDTG | IDL           | 4     | mg/dL | 5 - 100            |  |
| LDTG | LDL           | 14    | mg/dL | 12 - 45            |  |
| HDTG | HDL           | 8     | mg/dL | 7 - 29             |  |




| Key  | Cholesterol | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|-------------|-------|-------|--------------------|---|
| VLCH | VLDL        | 10    | mg/dL | 5 - 77             |  |
| IDCH | IDL         | 4     | mg/dL | 4 - 50             |  |
| LDCH | LDL         | 82    | mg/dL | 55 - 227           |  |
| HDCH | HDL         | 69    | mg/dL | 35 - 96            |  |

| Key  | Free Cholesterol | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|------------------|-------|-------|--------------------|---|
| VLFC | VLDL             | 6     | mg/dL | 3 - 33             |  |
| IDFC | IDL              | 1     | mg/dL | 1 - 14             |  |
| LDFC | LDL              | 27    | mg/dL | 17 - 63            |  |
| HDFC | HDL              | 17    | mg/dL | 7 - 27             |  |

| Key  | Phospholipids | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|---------------|-------|-------|--------------------|---|
| VLPL | VLDL          | 13    | mg/dL | 6 - 68             |  |
| IDPL | IDL           | 3     | mg/dL | 3 - 33             |  |
| LDPL | LDL           | 48    | mg/dL | 37 - 121           |  |
| HDPL | HDL           | 85    | mg/dL | 57 - 136           |  |






| Key  | Apo-A1 | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|--------|-------|-------|--------------------|---|
| HDA1 | HDL    | 165   | mg/dL | 110 - 222          |  |






| Key  | Apo-A2 | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|--------|-------|-------|--------------------|---|
| HDA2 | HDL    | 32    | mg/dL | 25 - 48            |  |






| Key  | Apo-B | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|-------|-------|-------|--------------------|---|
| VLAB | VLDL  | 6     | mg/dL | 3 - 26             |  |
| IDAB | IDL   | 3     | mg/dL | 2 - 17             |  |
| LDAB | LDL   | 52    | mg/dL | 42 - 141           |  |






(\*) Gray horizontal boxes represent 95% range of model, black vertical lines represent sample value.

## VLDL Subfractions

| Key  | Triglycerides | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|---------------|-------|-------|--------------------|---|
| V1TG | VLDL-1        | 17    | mg/dL | 6 - 212            |  |
| V2TG | VLDL-2        | 9     | mg/dL | 3 - 67             |  |
| V3TG | VLDL-3        | 8     | mg/dL | 2 - 49             |  |
| V4TG | VLDL-4        | 8     | mg/dL | 3 - 28             |  |
| V5TG | VLDL-5        | 3     | mg/dL | 1 - 7              |  |






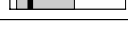
| Key  | Cholesterol | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|-------------|-------|-------|--------------------|---|
| V1CH | VLDL-1      | 2     | mg/dL | 1 - 35             |  |
| V2CH | VLDL-2      | 1     | mg/dL | 0 - 15             |  |
| V3CH | VLDL-3      | 1     | mg/dL | 0 - 16             |  |
| V4CH | VLDL-4      | 3     | mg/dL | 1 - 15             |  |
| V5CH | VLDL-5      | 1     | mg/dL | 0 - 4              |  |






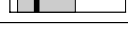
| Key  | Free Cholesterol | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|------------------|-------|-------|--------------------|---|
| V1FC | VLDL-1           | 1     | mg/dL | 0 - 13             |  |
| V2FC | VLDL-2           | 1     | mg/dL | 0 - 7              |  |
| V3FC | VLDL-3           | 1     | mg/dL | 0 - 8              |  |
| V4FC | VLDL-4           | 1     | mg/dL | 0 - 7              |  |
| V5FC | VLDL-5           | 0     | mg/dL | 0 - 2              |  |






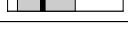
| Key  | Phospholipids | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|---------------|-------|-------|--------------------|---|
| V1PL | VLDL-1        | 2     | mg/dL | 1 - 32             |  |
| V2PL | VLDL-2        | 2     | mg/dL | 1 - 15             |  |
| V3PL | VLDL-3        | 2     | mg/dL | 1 - 14             |  |
| V4PL | VLDL-4        | 3     | mg/dL | 2 - 13             |  |
| V5PL | VLDL-5        | 1     | mg/dL | 0 - 5              |  |






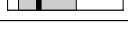
(\*) Gray horizontal boxes represent 95% range of model, black vertical lines represent sample value.






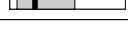
## LDL Subfractions

| Key  | Triglycerides | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|---------------|-------|-------|--------------------|---|
| L1TG | LDL-1         | 4     | mg/dL | 3 - 14             |  |
| L2TG | LDL-2         | 2     | mg/dL | 1 - 6              |  |
| L3TG | LDL-3         | 2     | mg/dL | 1 - 6              |  |
| L4TG | LDL-4         | 1     | mg/dL | 1 - 8              |  |
| L5TG | LDL-5         | 2     | mg/dL | 1 - 9              |  |
| L6TG | LDL-6         | 4     | mg/dL | 1 - 13             |  |

| Key  | Cholesterol | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|-------------|-------|-------|--------------------|---|
| L1CH | LDL-1       | 13    | mg/dL | 8 - 59             |    |
| L2CH | LDL-2       | 15    | mg/dL | 2 - 48             |    |
| L3CH | LDL-3       | 10    | mg/dL | 3 - 46             |    |
| L4CH | LDL-4       | 8     | mg/dL | 4 - 49             |    |
| L5CH | LDL-5       | 12    | mg/dL | 5 - 49             |   |
| L6CH | LDL-6       | 22    | mg/dL | 6 - 54             |  |





| Key  | Free Cholesterol | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|------------------|-------|-------|--------------------|---|
| L1FC | LDL-1            | 5     | mg/dL | 2 - 17             |  |
| L2FC | LDL-2            | 6     | mg/dL | 1 - 14             |  |
| L3FC | LDL-3            | 5     | mg/dL | 1 - 13             |  |
| L4FC | LDL-4            | 4     | mg/dL | 1 - 12             |  |
| L5FC | LDL-5            | 4     | mg/dL | 2 - 13             |  |
| L6FC | LDL-6            | 6     | mg/dL | 2 - 12             |  |





| Key  | Phospholipids | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|---------------|-------|-------|--------------------|---|
| L1PL | LDL-1         | 9     | mg/dL | 6 - 30             |  |
| L2PL | LDL-2         | 8     | mg/dL | 2 - 25             |  |
| L3PL | LDL-3         | 6     | mg/dL | 2 - 24             |  |
| L4PL | LDL-4         | 5     | mg/dL | 3 - 25             |  |
| L5PL | LDL-5         | 7     | mg/dL | 4 - 25             |  |
| L6PL | LDL-6         | 13    | mg/dL | 4 - 28             |  |





| Key  | Apo-B | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|-------|-------|-------|--------------------|---|
| L1AB | LDL-1 | 8     | mg/dL | 5 - 31             |  |
| L2AB | LDL-2 | 8     | mg/dL | 3 - 23             |  |
| L3AB | LDL-3 | 6     | mg/dL | 3 - 27             |  |
| L4AB | LDL-4 | 5     | mg/dL | 4 - 32             |  |
| L5AB | LDL-5 | 9     | mg/dL | 5 - 34             |  |
| L6AB | LDL-6 | 17    | mg/dL | 5 - 45             |  |





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## HDL Subfractions





| Key  | Triglycerides | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|---------------|-------|-------|--------------------|---|
| H1TG | HDL-1         | 3     | mg/dL | 1 - 12             |  |
| H2TG | HDL-2         | 1     | mg/dL | 1 - 5              |  |
| H3TG | HDL-3         | 2     | mg/dL | 1 - 5              |  |
| H4TG | HDL-4         | 2     | mg/dL | 2 - 8              |  |

| Key  | Cholesterol | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|-------------|-------|-------|--------------------|---|
| H1CH | HDL-1       | 23    | mg/dL | 6 - 46             |  |
| H2CH | HDL-2       | 11    | mg/dL | 4 - 16             |  |
| H3CH | HDL-3       | 12    | mg/dL | 7 - 19             |  |
| H4CH | HDL-4       | 21    | mg/dL | 11 - 30            |  |

| Key  | Free Cholesterol | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|------------------|-------|-------|--------------------|---|
| H1FC | HDL-1            | 6     | mg/dL | 1 - 12             |   |
| H2FC | HDL-2            | 2     | mg/dL | 1 - 5              |  |
| H3FC | HDL-3            | 3     | mg/dL | 1 - 5              |  |
| H4FC | HDL-4            | 4     | mg/dL | 2 - 9              |  |

| Key  | Phospholipids | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|---------------|-------|-------|--------------------|---|
| H1PL | HDL-1         | 26    | mg/dL | 8 - 57             |  |
| H2PL | HDL-2         | 15    | mg/dL | 7 - 27             |  |
| H3PL | HDL-3         | 17    | mg/dL | 12 - 32            |  |
| H4PL | HDL-4         | 27    | mg/dL | 20 - 44            |  |

| Key  | Apo-A1 | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|--------|-------|-------|--------------------|---|
| H1A1 | HDL-1  | 36    | mg/dL | 6 - 75             |  |
| H2A1 | HDL-2  | 20    | mg/dL | 10 - 36            |  |
| H3A1 | HDL-3  | 29    | mg/dL | 18 - 47            |  |
| H4A1 | HDL-4  | 77    | mg/dL | 56 - 110           |  |

| Key  | Apo-A2 | Value | Unit  | 95% Range of Model | Graphics (*)  |
|------|--------|-------|-------|--------------------|---|
| H1A2 | HDL-1  | 3     | mg/dL | 1 - 8              |  |
| H2A2 | HDL-2  | 3     | mg/dL | 2 - 8              |  |
| H3A2 | HDL-3  | 6     | mg/dL | 5 - 12             |  |
| H4A2 | HDL-4  | 18    | mg/dL | 12 - 30            |  |

(\*) Gray horizontal boxes represent 95% range of model, black vertical lines represent sample value.

## Explanations

**Bruker IVDr Lipoprotein Subclass Analysis B.I.LISA™** has been developed for analysis of spectra from human plasma or serum samples acquired on base of Bruker's preparation and measurement SOPs.

**Bruker IVDr Lipoprotein Subclass Analysis B.I.LISA™** uses regression models to predict the concentration of the parameters listed in this report. The regression models were established on base of training data combining NMR spectroscopy data and ultracentrifugation based data. Listed parameters are in part highly correlated.

Incompliance to Bruker's NMR preparation and measurement SOPs may result in major errors in the concentrations determined by **Bruker IVDr Lipoprotein Subclass Analysis B.I.LISA™**.

### Principal lipoprotein classes:

|      |                                    |
|------|------------------------------------|
| VLDL | : Very Low Density Lipoprotein     |
| IDL  | : Intermediate Density Lipoprotein |
| LDL  | : Low Density Lipoprotein          |
| HDL  | : High Density Lipoprotein         |

### Densities (in kg/L) of Lipoprotein Main Fractions:

| VLDL          | IDL           | LDL           | HDL           |
|---------------|---------------|---------------|---------------|
| 0.950 - 1.006 | 1.006 - 1.019 | 1.019 - 1.063 | 1.063 - 1.210 |

### Density of the Very Low Density Lipoprotein Subfractions:

5 subfractions VLDL-1 ... VLDL-5, numbering according to increasing density.  
Subfractions properties are specified in [1]

### Densities (in kg/L) of Low Density Lipoprotein Subfractions:

| LDL-1         | LDL-2         | LDL-3         | LDL-4         | LDL-5         | LDL-6         |
|---------------|---------------|---------------|---------------|---------------|---------------|
| 1.019 - 1.031 | 1.031 - 1.034 | 1.034 - 1.037 | 1.037 - 1.040 | 1.040 - 1.044 | 1.044 - 1.063 |

### Densities (in kg/L) of High Density Lipoprotein Subfractions:

| HDL-1         | HDL-2         | HDL-3         | HDL-4         |
|---------------|---------------|---------------|---------------|
| 1.063 - 1.100 | 1.100 - 1.112 | 1.112 - 1.125 | 1.125 - 1.210 |

### Citations related to reference method (ultracentrifugation) used for development of models:

- 1 Lindgren FT, Jensen LL, Hatch FT (1972) The isolation and quantitative analysis of serum lipoproteins. In: Nelson GJ (ed.) Blood lipids and lipoproteins: Quantitation, composition and metabolism. Wiley-Interscience, New York, p 181-274
- 2 Lindgren FT (1975) Preparative ultracentrifugal laboratory procedures and suggestions for lipoprotein analysis. In: Perkins EG (ed.) Analysis of lipids and lipoproteins. American Oil Chemists' Society, Champaign, Ill., p 204-24
- 3 Anderson DW, Nichols AV, Forte TM, Lindgren FT (1977) Particle distribution of human serum high density lipoproteins. Biochim Biophys Acta 493: 55-68
- 4 Baumstark MW, Kreutz W, Berg A, Frey I, Keul J (1990) Structure of human low-density lipoprotein subfractions, determined by X-ray small-angle scattering. Biochim Biophys Acta 1037: 48-57