Supplementary **Figure 1**. Representation of cognitive assessment test.



Supplementary **Table 1**. Composition of MFGM concentrate supplement isolated from buttermilk (BMC). **A)** Global composition; **B)** Fatty acid profile; **C)** Lipid classes and polar lipids profile.

****CE, Cholesterol esters; TAG, triacylglycerols; FFA+Chol, free fatty acids + cholesterol; DAG, diacylglycerols; MAG, monoacylglycerols; PL, Polar Lipids; PE, phosphatidylethanolamine; PI, phosphatidyl inositol; PS, phosphatidylserine; PC, phosphatidylcholine; SM, sphingomyelin. Glucer, glucosylceramides; Lacer, lactosylceramides; AA, arachidonic acid; ALA, -linolenic acid; LA, linoleic acid; CLA, Conjugate linoleic acid; MUFA, monounsaturated fatty acids; PUFA, polyunsaturated fatty acids; SFA, saturated fatty acids

Supplementary **Table 2.** Fat content (g/100g tissue) of the tissues after control diet and MFGM concentrate supplement (BMC) diets.



a,b Means with different superscript letters within a row are significantly different (*P* < 0.05).

SAT: subcutaneous adipose tissue; VAT: visceral adipose tissue; RBC: Red blood cells or erythrocytes; CB: cerebelum, TC: temporal cortex, OC: occipital cortex

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **SAT** |  | **VAT** |  | **Liver** |  | **Plasma** |  | **Erythrocytes** |
| **Fatty Acid****(g/100g fat)** | CD |  | BMC |  | CD |  | BMC |  | CD |  | BMC |  | CD |  | BMC |  | CD |  | BMC |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **C14:0** | 0.66 | ± | 0.09 |  | 0.82 | ± | 0.15 |  | 0.74 | ± | 0.11 |  | 0.89 | ± | 0.14 |  | 0.45 | ± | 0.13 |  | 0.45 | ± | 0.15 |  | 0.46 | ± | 0.25 |  | 0.46 | ± | 0.15 |  | 0.42 | ± | 0.21 |  | 0.50 | ± | 0.15 |
| **C15:0 DMA** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.17 | ± | 0.04 |  | 0.18 | ± | 0.07 |
| **C15:0** | 0.23 | ± | 0.02 |  | 0.23 | ± | 0.06 |  | 0.29 | ± | 0.03 |  | 0.32 | ± | 0.05 |  | 0.18 | ± | 0.04 |  | 0.19 | ± | 0.03 |  | 0.19 | ± | 0.05 |  | 0.20 | ± | 0.03 |  | 0.55 | ± | 0.10 |  | 0.58 | ± | 0.10 |
| **C16:0 DMA** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 2.37 | ± | 0.45 |  | 2.47 | ± | 0.27 |
| **C16:0** | 17.70 | ± | 1.91 |  | 17.03 | ± | 1.58 |  | 21.90 | ± | 1.55 |  | 20.80 | ± | 2.04 |  | 21.50 | ± | 2.59 |  | 19.92 | ± | 1.27 |  | 21.56 | ± | 5.09 |  | 20.19 | ± | 0.76 |  | 54.45 | ± | 4.66 |  | 52.85 | ± | 3.54 |
| **C17:0 *iso*** | 0.41 | ± | 0.08 |  | 0.36 | ± | 0.15 |  | 0.53 | ± | 0.06 |  | 0.51 | ± | 0.07 |  | 0.20 | ± | 0.07 |  | 0.20 | ± | 0.04 |  | 0.09 | ± | 0.10 |  | 0.04 | ± | 0.07 |  |  |  |  |  |  |  |  |
| **C16:1*cis9*** | 4.35 | ± | 1.86 |  | 5.21 | ± | 1.72 |  | 3.22 | ± | 0.75 |  | 3.09 | ± | 1.16 |  | 2.83 | ± | 1.00 |  | 2.63 | ± | 1.16 |  | 2.18 | ± | 1.12 |  | 2.16 | ± | 1.03 |  | 0.77 | ± | 0.31 |  | 0.97 | ± | 0.40 |
| **C17:0** | 0.13 | ± | 0.04 |  | 0.11 | ± | 0.05 |  | 0.20 | ± | 0.02 |  | 0.22 | ± | 0.04 |  | 0.21 | ± | 0.05 |  | 0.24 | ± | 0.04 |  | 0.13 | ± | 0.03 |  | 0.13 | ± | 0.03 |  | 0.64 | ± | 0.09 |  | 0.69 | ± | 0.12 |
| **C18:1DMA** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1.81 | ± | 0.36 |  | 1.95 | ± | 0.22 |
| **C18:0 *iso*** |  |  |  |  |  |  |  |  | 0.08 | ± | 0.01 |  | 0.09 | ± | 0.03 |  | 0.12 | ± | 0.04 |  | 0.15 | ± | 0.04 |  |  |  |  |  |  |  |  |  | 0.15 | ± | 0.03 |  | 0.17 | ± | 0.03 |
| **C17:1** | 0.11 | ± | 0.04 |  | 0.10 | ± | 0.07 |  | 0.12 | ± | 0.02 |  | 0.12 | ± | 0.02 |  | 0.05 | ± | 0.03 |  | 0.07 | ± | 0.03 |  |  |  |  |  |  |  |  |  | 0.36 | ± | 0.10 |  | 0.42 | ± | 0.11 |
| **C18:1DMA** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.22 | ± | 0.07 |  | 0.23 | ± | 0.07 |
| **C18:0** | 1.40 | ± | 0.45 |  | 1.15 | ± | 0.36 |  | 2.18 | ± | 0.24 |  | 2.15 | ± | 0.44 |  | 7.93 | ± | 1.73 |  | 7.70 | ± | 1.09 |  | 7.77 | ± | 2.03 |  | 6.90 | ± | 1.44 |  | 17.40 | ± | 2.31 |  | 16.52 | ± | 2.02 |
| **C18:1*cis9*** | 25.63 | ± | 1.38 |  | 26.32 | ± | 1.99 |  | 27.53 | ± | 1.68 |  | 27.15 | ± | 1.88 |  | 10.11 | ± | 2.47 |  | 8.99 | ± | 1.16 |  | 8.79 | ± | 2.03 |  | 9.16 | ± | 1.69 |  | 5.80 | ± | 0.78a |  | 6.93 | ± | 2.29b |
| **C18:1*cis11*** | 6.08 | ± | 0.49 |  | 5.72 | ± | 0.69 |  | 6.70 | ± | 0.68 |  | 6.53 | ± | 0.62 |  | 4.81 | ± | 0.70 |  | 4.55 | ± | 0.88 |  | 2.73 | ± | 0.91 |  | 2.78 | ± | 0.68 |  | 4.20 | ± | 0.40 |  | 4.40 | ± | 0.48 |
| **C18:2 n-6 (LA)** | 39.17 | ± | 2.27 |  | 39.19 | ± | 2.32 |  | 34.07 | ± | 2.78 |  | 35.15 | ± | 3.00 |  | 15.78 | ± | 2.68 |  | 16.31 | ± | 3.58 |  | 20.13 | ± | 3.39 |  | 21.46 | ± | 2.83 |  | 4.74 | ± | 1.66 |  | 5.05 | ± | 1.31 |
| **C18:3n-6 (GLA)** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.09 | ± | 0.06 |  | 0.11 | ± | 0.05 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **C18:3n-3 (ALA)** | 1.58 | ± | 0.43 |  | 1.34 | ± | 0.69 |  | 1.00 | ± | 0.28 |  | 1.14 | ± | 0.43 |  | 0.33 | ± | 0.15 |  | 0.42 | ± | 0.24 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **C20:1** | 0.39 | ± | 0.19 |  | 0.27 | ± | 0.20 |  | 0.26 | ± | 0.07 |  | 0.31 | ± | 0.11 |  | 0.12 | ± | 0.05 |  | 0.14 | ± | 0.06 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **C20:2 n-6** | 0.26 | ± | 0.10 |  | 0.25 | ± | 0.15 |  | 0.14 | ± | 0.05 |  | 0.17 | ± | 0.07 |  | 0.29 | ± | 0.10 |  | 0.33 | ± | 0.12 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **C22:0** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.06 | ± | 0.04 |  | 0.08 | ± | 0.04 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **C20:3 n-6 (DGLA)** | 0.14 | ± | 0.06 |  | 0.15 | ± | 0.10 |  | 0.09 | ± | 0.03a |  | 0.13 | ± | 0.06b |  | 0.50 | ± | 0.12a |  | 0.62 | ± | 0.14b |  | 0.19 | ± | 0.11 |  | 0.20 | ± | 0.07 |  |  |  |  |  |  |  |  |
| **C20:4 (AA)** | 1.15 | ± | 0.42 |  | 1.09 | ± | 0.42 |  | 0.61 | ± | 0.13 |  | 0.74 | ± | 0.25 |  | 25.25 | ± | 3.71 |  | 27.07 | ± | 2.41 |  | 33.08 | ± | 5.99 |  | 33.20 | ± | 4.29 |  | 5.43 | ± | 2.47 |  | 5.43 | ± | 2.16 |
| **C20:5 n-3 (EPA)** | 0.27 | ± | 0.16 |  | 0.27 | ± | 0.17 |  | 0.15 |  | 0.05 |  | 0.20 |  | 0.09 |  | 0.71 | ± | 0.28 |  | 0.87 | ± | 0.40 |  | 0.26 | ± | 0.12 |  | 0.33 | ± | 0.14 |  | 0.20 | ± | 0.10 |  | 0.24 | ± | 0.08 |
| **C24:0** | 0.05 | ± | 0.05 |  | 0.04 | ± | 0.04 |  | 0.03 | ± | 0.01 |  | 0.04 | ± | 0.02 |  | 0.62 | ± | 0.26 |  | 0.59 | ± | 0.32 |  | 0.16 | ± | 0.10 |  | 0.17 | ± | 0.12 |  | 0.15 | ± | 0.14 |  | 0.19 | ± | 0.14 |
| **C22:5 n-3 (DPA)** | 0.14 | ± | 0.10 |  | 0.16 | ± | 0.13 |  | 0.07 | ± | 0.03 |  | 0.12 | ± | 0.08 |  | 0.96 | ± | 0.35 |  | 1.10 | ± | 0.35 |  | 0.25 | ± | 0.16 |  | 0.29 | ± | 0.15 |  | 0.06 | ± | 0.02 |  | 0.09 | ± | 0.05 |
| **C22:6 n-3 (DHA)** | 0.18 | ± | 0.13 |  | 0.19 | ± | 0.14 |  | 0.09 | ± | 0.04 |  | 0.13 | ± | 0.07 |  | 6.73 | ± | 1.30 |  | 7.03 | ± | 0.92 |  | 2.03 | ± | 0.70 |  | 2.32 | ± | 0.40 |  | 0.11 | ± | 0.05 |  | 0.13 | ± | 0.08 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **ΣDMA** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4.57 | ± | 0.81 |  | 4.83 | ± | 0.46 |
| **ΣSFA** | 20.53 | ± | 2.12 |  | 19.72 | ± | 1.87 |  | 25.92 | ± | 1.71 |  | 24.99 | ± | 2.52 |  | 31.28 | ± | 3.43 |  | 29.53 | ± | 1.93 |  | 30.36 | ± | 6.23 |  | 28.08 | ± | 1.48 |  | 73.81 | ± | 4.81 |  | 71.55 | ± | 4.54 |
| **ΣMUFA** | 36.57 | ± | 2.63 |  | 37.63 | ± | 2.51 |  | 37.84 | ± | 2.26 |  | 37.22 | ± | 2.25 |  | 17.92 | ± | 3.49 |  | 16.37 | ± | 2.37 |  | 13.70 | ± | 3.71 |  | 14.11 | ± | 3.18 |  | 11.13 | ± | 1.14 |  | 12.72 | ± | 2.72 |
| **ΣPUFA** | 42.90 | ± | 2.54 |  | 42.65 | ± | 1.85 |  | 36.24 | ± | 3.07 |  | 37.79 | ± | 3.83 |  | 50.63 | ± | 5.59 |  | 53.87 | ± | 3.26 |  | 55.94 | ± | 6.62 |  | 57.81 | ± | 2.28 |  | 10.49 | ± | 3.84 |  | 10.90 | ± | 3.14 |
| **ΣMCFA** | 0.89 | ± | 0.10 |  | 1.06 | ± | 0.20 |  | 1.03 | ± | 0.12 |  | 1.21 | ± | 0.16 |  | 0.63 | ± | 0.16 |  | 0.64 | ± | 0.16 |  | 0.65 | ± | 0.29 |  | 0.66 | ± | 0.16 |  | 0.97 | ± | 0.29 |  | 1.08 | ± | 0.17 |
| **ΣLCFA** | 96.59 | ± | 1.09 |  | 96.55 | ± | 1.40 |  | 97.55 | ± | 0.34 |  | 96.98 | ± | 0.61 |  | 63.97 | ± | 4.87 |  | 61.29 | ± | 2.39 |  | 63.38 | ± | 6.23 |  | 62.82 | ± | 4.02 |  | 88.51 | ± | 2.95 |  | 88.01 | ± | 2.45 |
| **ΣVLCFA** | 2.52 | ± | 1.06 |  | 2.39 | ± | 1.25 |  | 1.42 | ± | 0.33 |  | 1.81 | ± | 0.64 |  | 35.40 | ± | 4.97 |  | 38.07 | ± | 2.42 |  | 35.97 | ± | 6.46 |  | 36.52 | ± | 4.14 |  | 5.95 | ± | 2.50 |  | 6.08 | ± | 2.21 |
| **Σn-6** | 40.7 | ± | 2.2 |  | 40.7 | ± | 2.0 |  | 34.9 | ± | 2.8 |  | 36.2 | ± | 3.3 |  | 26.1 | ± | 3.8 |  | 28.1 | ± | 2.3 |  | 53.40 | ± | 6.04 |  | 54.86 | ± | 2.45 |  | 10.17 | ± | 3.89 |  | 10.49 | ± | 3.14 |
| **Σn-3** | 2.2 | ± | 0.7 |  | 2.0 | ± | 1.1 |  | 1.3 | ± | 0.3 |  | 1.6 | ± | 0.6 |  | 8.7 | ± | 1.8 |  | 9.4 | ± | 1.4 |  | 2.54 | ± | 0.87 |  | 2.95 | ± | 0.58 |  | 0.37 | ± | 0.15 |  | 0.46 | ± | 0.16 |

Supplementary **Table 3.** Fatty acid composition (g/100g fat) of subcutaneous adipose tissue (SAT), visceral adipose tissue (VAT), liver, plasma and erythrocytes from aged rats fed control diet (CD) or MFGM concentrate supplement (BMC). Data expressed as means ± SD from aged rats.

a,b Means with different superscript letters within a row are significantly different (*P*< 0.05).

Supplementary **Table 4.** Lipid classes profile (g/100g fat) of subcutaneous adipose tissue (SAT), visceral adipose tissue (VAT), liver, of plasma and erythrocytes from aged rats fed control diet (CD) or MFGM concentrate supplement (BMC). Data are expressed as means ± SD.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | SAT |  | VAT |  | Liver |  | Plasma |  | Erythrocytes |
|  | CD |  | BMC |  | CD |  | BMC |  | CD |  | BMC |  | CD |  | BMC |  | CD |  | BMC |
| **CE** | 0.01 | ± | 0.00 |  | 0.01 | ± | 0.00 |  | 0.01 | ± | 0.01 |  | 0.01 | ± | 0.01 |  | 3.33 | ± | 1.04 |  | 3.86 | ± | 1.84 |  | 31.69a | ± | 4.00 |  | 27.73b | ± | 3.97 |  | 0.65 | ± | 0.72 |  | 0.70 | ± | 0.59 |
| **TAG** | 99.84 | ± | 0.05 |  | 99.82 | ± | 0.10 |  | 99.89 | ± | 0.02 |  | 99.90 | ± | 0.03 |  | 38.69 | ± | 11.82 |  | 38.29 | ± | 11.30 |  | 29.42b | ± | 7.19 |  | 39.54a | ± | 10.07 |  | 0.41 | ± | 0.26 |  | 0.75 | ± | 0.55 |
| **DAG** | 0.12 | ± | 0.04 |  | 0.13 | ± | 0.07 |  | 0.03 | ± | 0.03 |  | 0.02 | ± | 0.03 |  | 6.76 | ± | 4.39 |  | 4.97 | ± | 3.37 |  | 0.40 | ± | 0.25 |  | 0.30 | ± | 0.06 |  | 1.68 | ± | 0.82 |  | 3.86 | ± | 3.37 |
| **FFA+CHOL** | 0.03 | ± | 0.02 |  | 0.03 | ± | 0.04 |  | 0.00 | ± | 0.00 |  | 0.00 | ± | 0.00 |  | 8.31 | ± | 2.08 |  | 7.63 | ± | 3.43 |  | 13.15a | ± | 3.33 |  | 7.73b | ± | 3.64 |  | 29.67a | ± | 1.77 |  | 26.43b | ± | 2.43 |
| **MAG** | 0.01 | ± | 0.00 |  | 0.01 | ± | 0.00 |  | 0.00 | ± | 0.00 |  | 0.00 | ± | 0.00 |  | 0.31 | ± | 0.54 |  | 0.24 | ± | 0.38 |  | 0.04 | ± | 0.03 |  | 0.01 | ± | 0.01 |  | 3.82 | ± | 1.66 |  | 4.03 | ± | 1.08 |
| **∑PL** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 42.60 | ± | 11.48 |  | 45.02 | ± | 8.40 |  | 25.12 | ± | 2.66 |  | 22.94 | ± | 2.72 |  | 63.78 | ± | 2.26 |  | 64.23 | ± | 3.02 |
| g/100g of PL |
| **PA** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.83 | ± | 0.65 |  | 0.86 | ± | 0.35 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **PE** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 21.93 | ± | 4.03 |  | 21.49 | ± | 6.52 |  | 0.20 | ± | 0.06 |  | 0.24 | ± | 0.07 |  | 5.47 | ± | 1.88 |  | 5.65 | ± | 1.92 |
| **PI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.84 | ± | 0.96 |  | 1.37 | ± | 0.97 |  | 1.48 | ± | 0.96 |  | 1.69 | ± | 0.87 |  |  |  |  |  |  |  |  |
| **PS** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.12 | ± | 0.13 |  | 0.10 | ± | 0.11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **PC** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 74.30 | ± | 3.78 |  | 74.22 | ± | 5.19 |  | 94.06 | ± | 1.13 |  | 94.11 | ± | 0.96 |  | 75.00 | ± | 1.69 |  | 74.36 | ± | 1.95 |
| **SM** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1.99 | ± | 0.63 |  | 1.97 | ± | 1.04 |  | 4.27 | ± | 0.95 |  | 3.97 | ± | 0.84 |  | 19.53 | ± | 1.53 |  | 19.99 | ± | 2.39 |

a,b Means with different superscript letters within a row are significantly different (*P*< 0.05).

CE, Cholesterol esters; TAG, triacylglycerols; FFA+Chol, DAG, diacylglycerols; free fatty acids + cholesterol; MAG, monoacylglycerols; PL, Polar Lipids; PE, phosphatidylethanolamine; PI, phosphatidyl inositol; PS, phosphatidylserine; PC, phosphatidylcholine; SM, sphingomyelin

**Supplementary Table 5.** Fatty acid composition (g/100g fat) of cerebelum (CB), temporal cortex (TC) and occipital cortex (OC) from aged rats fed control (CD) or MFGM concentrate supplement (BMC). Data expressed as means ± SD.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | CB |  | TC |  | OC |
|  |  | CT |  | BMC |  | CT |  | BMC |  | CT |  | BMC |
| **C14:0** |  | 0.07 | ± | 0.01 |  | 0.07 | ± | 0.01 |  | 0.07 | ± | 0.01 |  | 0.07 | ± | 0.01 |  | 0.06 | ± | 0.01 |  | 0.09 | ± | 0.10 |
| **C16:0 DMA** |  | 2.18 | ± | 0.20 |  | 2.14 | ± | 0.20 |  | 1.59 | ± | 0.10 |  | 1.50 | ± | 0.14 |  | 1.88 | ± | 0.19 |  | 1.80 | ± | 0.22 |
| **C16:0** |  | 16.25 | ± | 1.04 |  | 16.20 | ± | 0.90 |  | 17.69 | ± | 0.72 |  | 17.26 | ± | 1.36 |  | 18.84 | ± | 0.87 |  | 18.45 | ± | 1.42 |
| **C16:1cis9** |  | 0.25 | ± | 0.02 |  | 0.24 | ± | 0.03 |  | 0.23 | ± | 0.03 |  | 0.23 | ± | 0.03 |  | 0.20 | ± | 0.02 |  | 0.19 | ± | 0.03 |
| **C17:0** |  | 0.14 | ± | 0.01 |  | 0.15 | ± | 0.01 |  | 0.10 | ± | 0.01 |  | 0.10 | ± | 0.01 |  | 0.09 | ± | 0.01 |  | 0.10 | ± | 0.02 |
| **C18:0 DMA** |  | 3.38 | ± | 0.17 |  | 3.37 | ± | 0.18 |  | 3.55 | ± | 0.12 |  | 3.49 | ± | 0.21 |  | 3.97 | ± | 0.55 |  | 3.69 | ± | 0.36 |
| **C17:1** |  | 1.52 | ± | 0.15 |  | 1.54 | ± | 0.11 |  | 1.27 | ± | 0.09 |  | 1.15 | ± | 0.18 |  | 1.01 | ± | 0.20 |  | 1.01 | ± | 0.30 |
| **C18:1DMA** |  | 2.60 | ± | 0.40 |  | 2.59 | ± | 0.27 |  | 1.60 | ± | 0.11 |  | 1.43 | ± | 0.20 |  | 1.22 | ± | 0.22 |  | 1.23 | ± | 0.53 |
| **C18:0** |  | 13.78 | ± | 1.02 |  | 13.45 | ± | 0.57 |  | 15.84 | ± | 0.45 |  | 15.49 | ± | 0.73 |  | 16.98 | ± | 1.04 |  | 17.07 | ± | 1.40 |
| **C18:1 cis9** |  | 16.35 | ± | 0.80 |  | 16.37 | ± | 0.62 |  | 15.72 | ± | 0.33 |  | 15.04 | ± | 0.62 |  | 13.91 | ± | 0.98 |  | 14.29 | ± | 1.03 |
| **C18:1cis11** |  | 4.36 | ± | 0.51 |  | 4.50 | ± | 0.21 |  | 2.75 | ± | 0.13 |  | 2.64 | ± | 0.13 |  | 2.47 | ± | 0.16 |  | 2.50 | ± | 0.56 |
| **C18:2n-6** |  | 0.49 | ± | 0.10a |  | 0.56 | ± | 0.10b |  | 0.28 | ± | 0.06 |  | 0.32 | ± | 0.09 |  | 0.23 | ± | 0.04 |  | 0.28 | ± | 0.12 |
| **C18:3n-6 (GLA)** |  | 0.19 | ± | 0.05 |  | 0.19 | ± | 0.03 |  | 0.08 | ± | 0.02 |  | 0.08 | ± | 0.02 |  | 0.08 | ± | 0.03 |  | 0.08 | ± | 0.05 |
| **C18:3 n-3(ALA)** |  | 4.90 | ± | 1.24 |  | 4.96 | ± | 0.69 |  | 1.93 | ± | 0.32 |  | 1.78 | ± | 0.44 |  | 1.43 | ± | 0.49 |  | 1.67 | ± | 1.35 |
| **C20:1** |  | 1.04 | ± | 0.27 |  | 1.01 | ± | 0.13 |  | 0.30 | ± | 0.06 |  | 0.28 | ± | 0.09 |  | 0.23 | ± | 0.08 |  | 0.28 | ± | 0.30 |
| **C22:0** |  | 0.38 | ± | 0.09 |  | 0.37 | ± | 0.06 |  | 0.26 | ± | 0.04 |  | 0.26 | ± | 0.07 |  | 0.22 | ± | 0.08 |  | 0.25 | ± | 0.10 |
| **C20:3 n-6** |  | 0.25 | ± | 0.03 |  | 0.26 | ± | 0.02 |  | 0.18 | ± | 0.03 |  | 0.19 | ± | 0.03 |  | 0.19 | ± | 0.02 |  | 0.21 | ± | 0.04 |
| **C20:4 (AA)** |  | 11.30 | ± | 0.85 |  | 11.20 | ± | 0.34 |  | 14.36 | ± | 0.34 |  | 14.56 | ± | 0.60 |  | 14.90 | ± | 1.32 |  | 14.98 | ± | 1.38 |
| **C20:5n-3 (EPA)** |  | 2.97 | ± | 0.38 |  | 2.86 | ± | 0.24 |  | 3.55 | ± | 0.25a |  | 3.80 | ± | 0.29b |  | 4.28 | ± | 0.34 |  | 4.19 | ± | 0.41 |
| **C24:0** |  | 0.31 | ± | 0.09 |  | 0.27 | ± | 0.06 |  | 0.39 | ± | 0.07a |  | 0.48 | ± | 0.08b |  | 0.54 | ± | 0.12 |  | 0.52 | ± | 0.13 |
| **C22:5n-3 (DPA)** |  | 0.16 | ± | 0.02 |  | 0.16 | ± | 0.02 |  | 0.09 | ± | 0.02a |  | 0.13 | ± | 0.02b |  | 0.13 | ± | 0.02a |  | 0.19 | ± | 0.07b |
| **C22:6n-3 (DHA)** |  | 17.14 | ± | 0.88 |  | 17.56 | ± | 1.49 |  | 18.16 | ± | 0.82a |  | 19.72 | ± | 1.56b |  | 17.14 | ± | 1.69 |  | 16.93 | ± | 1.82 |
| **ΣDMA** |  | 8.16 | ± | 0.46 |  | 8.10 | ± | 0.48 |  | 6.75 | ± | 0.17 |  | 6.41 | ± | 0.37 |  | 7.07 | ± | 0.79 |  | 6.72 | ± | 0.87 |
| **ΣSFA** |  | 30.92 | ± | 1.92 |  | 30.50 | ± | 1.21 |  | 37.28 | ± | 0.81a |  | 33.67 | ± | 1.75b |  | 36.74 | ± | 1.45 |  | 36.48 | ± | 2.32 |
| **ΣMUFA** |  | 23.52 | ± | 1.52 |  | 23.65 | ± | 0.92 |  | 20.27 | ± | 0.44a |  | 19.33 | ± | 0.93b |  | 17.82 | ± | 1.34 |  | 18.28 | ± | 1.92 |
| **ΣPUFA** |  | 37.40 | ± | 1.17 |  | 37.75 | ± | 1.67 |  | 38.63 | ± | 1.04a |  | 40.58 | ± | 1.60b |  | 38.38 | ± | 2.37 |  | 38.52 | ± | 2.16 |
| **ΣMCFA** |  | 0.07 | ± | 0.01 |  | 0.07 | ± | 0.01 |  | 0.07 | ± | 0.01 |  | 0.07 | ± | 0.01 |  | 0.06 | ± | 0.01 |  | 0.09 | ± | 0.10 |
| **ΣLCFA** |  | 58.22 | ± | 1.19 |  | 58.15 | ± | 1.47 |  | 55.89 | ± | 0.99a |  | 54.09 | ± | 1.49b |  | 55.24 | ± | 1.83 |  | 55.64 | ± | 2.04 |
| **ΣVLCFA** |  | 33.55 | ± | 1.51 |  | 33.69 | ± | 1.81 |  | 37.29 | ± | 1.00a |  | 39.42 | ± | 1.60b |  | 37.63 | ± | 2.53 |  | 37.54 | ± | 2.67 |
| **Σn-6** |  | 12.23 | ± | 0.76 |  | 12.21 | ± | 0.33 |  | 14.90 | ± | 0.40 |  | 15.15 | ± | 0.67 |  | 15.39 | ± | 1.31 |  | 15.55 | ± | 1.23 |
| **Σn-3** |  | 25.17 | ± | 1.19 |  | 25.54 | ± | 1.44 |  | 23.73 | ± | 0.88a |  | 25.44 | ± | 1.32b |  | 22.99 | ± | 1.70 |  | 22.97 | ± | 1.79 |

a,bMeans with different superscript letters within a row are significantly different (*P*< 0.05).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Lipid classes(%) |  | CB |  | OC |  | TC |
|  |  | CD |   | BMC |  | CD |  | BMC |  | CD |  | BMC |
| **DAG** |  | 1.28 | ± | 0.5 |  | 1.55 | ± | 0.61 |  | 1.13 | ± | 0.29 |  | 1.06 | ± | 0.64 |  | 0.88 | ± | 0.95 |  | 0.59 | ± | 0.24 |
| **FFA+CHOL** |  | 38.21 | ± | 4.37 |  | 38.11 | ± | 2.29 |  | 32.27 | ± | 1.62 |  | 28.6 | ± | 8.09 |  | 40.99 | ± | 2.31 |  | 39.37 | ± | 3.23 |
| **MAG** |  | 1.09 | ± | 0.29 |  | 1.26 | ± | 0.32 |  | 0.82 | ± | 0.23 |  | 0.83 | ± | 0.22 |  | 0.67 | ± | 0.14 |  | 0.64 | ± | 0.16 |
| **GluCer** |  | 2.64 | ± | 0.29 |  | 2.76 | ± | 0.55 |  | 1.5 | ± | 0.41 |  | 1.47 | ± | 0.55 |  | 1.72 | ± | 0.36 |  | 1.66 | ± | 0.45 |
| **Gangliosides** |  | 8.81b | ± | 3.09 |  | 9.78a | ± | 2.14 |  | 7.26 | ± | 1.77 |  | 7.64 | ± | 2.01 |  | 9.08 | ± | 1.10a |  | 7.64 | ± | 1.51b |
| **LacCer** |  | 1.31 | ± | 0.42 |  | 1.23 | ± | 0.31 |  | 1.5 | ± | 0.37 |  | 1.66 | ± | 0.58 |  | 1.17 | ± | 0.19 |  | 1.04 | ± | 0.28 |
| **∑PL** |   | 46.66 | ± | 3.23 |   | 45.31 | ± | 2.81 |   | 55.54 | ± | 2.05a |   | 58.74 | ± | 7.9 |   | 45.79 | ± | 1.23a |   | 47.91 | ± | 1.73b |
| g/100g of PL |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **PA** |  | 1.31 | ± | 0.36 |  | 1.5 | ± | 0.86 |  | 1.62 | ± | 0.39 |  | 1.57 | ± | 0.51 |  | 0.88 | ± | 0.11 |  | 0.98 | ± | 0.29 |
| **PE** |  | 45.42 | ± | 1.63 |  | 45.16 | ± | 1.88 |  | 40.64 | ± | 1.51 |  | 40.89 | ± | 1.74 |  | 46.67 | ± | 0.64 |  | 46.49 | ± | 1.44 |
| **PI** |  | 2.35 | ± | 0.42 |  | 2.49 | ± | 0.38 |  | 3.46a | ± | 0.4 |  | 2.88b | ± | 0.65 |  | 1.61 | ± | 0.18 |  | 1.73 | ± | 0.25 |
| **PS** |  | 10.82 | ± | 0.51a |  | 10.18 | ± | 0.64b |  | 12.48 | ± | 0.54 |  | 12.71 | ± | 0.54 |  | 11.64 | ± | 0.52 |  | 11.72 | ± | 0.96 |
| **PC** |  | 37.9 | ± | 1.22 |  | 38.51 | ± | 1.01 |  | 37.64 | ± | 1.23 |  | 38.57 | ± | 1.56 |  | 37.69 | ± | 0.65 |  | 37.69 | ± | 0.71 |
| **SM** |   | 2.29 | ± | 0.54 |   | 2.16 | ± | 0.52 |   | 4.16 | ± | 1.08 |   | 3.38 | ± | 1.25 |   | 1.51 | ± | 0.36 |   | 1.39 | ± | 0.4 |

**Supplementary Table 6.** Lipid classes profile (g/100g fat) of cerebellum (CB) occipital cortex (OC) and temporal cortex (TC) from aged rats fed control diet (CD) or MFGM concentrate supplement (BMC). Data expressed as means ± SD.

a, b Means with different superscript letters within a row and between extraction methods are significantly different (*P* < 0.05).

DAG, diacylglycerols; FFA+Chol, free fatty acids + cholesterol; MAG, monoacylglycerols; PL, GluCer, glucosylceramides; LacCer, lactosylceramides; Polar Lipids; PE, phosphatidylethanolamine; PI, phosphatidyl inositol; PS, phosphatidylserine; PC, phosphatidylcholine; SM, sphingomyelin