Supplementary Material 4

**Table S4.1 Differences of the lipid species in brain from control and HFD-STZ groups**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Lipid species | Amount (nmol/g tissue, or nmol/mL serum)a | | Fold of  change | *P* valueb |
| Con | HFD |
| CL68:2 | 0.0666 ± 0.0588 | 0.0153 ± 0.0080 | 0.23 | 0.016 |
| CL68:3 | 0.0435 ± 0.0407 | 0.0103 ± 0.0058 | 0.24 | 0.056 |
| CL68:4 | 0.0891 ± 0.0925 | 0.0244 ± 0.0121 | 0.27 | 0.056 |
| CL70:3 | 0.1580 ± 0.1047 | 0.0309 ± 0.0064 | 0.20 | 0.008 |
| CL70:4 | 0.3659 ± 0.2936 | 0.0974 ± 0.0336 | 0.27 | 0.016 |
| CL70:5 | 0.1513 ± 0.1084 | 0.0858 ± 0.0420 | 0.57 | 0.548 |
| CL70:6 | 0.1505 ± 0.1038 | 0.0524 ± 0.0233 | 0.35 | 0.095 |
| CL70:7 | 0.0498 ± 0.0307 | 0.0117 ± 0.0058 | 0.23 | 0.008 |
| CL72:4 | 0.8969 ± 0.6902 | 0.2309 ± 0.0782 | 0.26 | 0.008 |
| CL72:5 | 0.6397 ± 0.4517 | 0.2963 ± 0.1014 | 0.46 | 0.310 |
| CL72:6 | 0.3659 ± 0.2261 | 0.1655 ± 0.0689 | 0.45 | 0.095 |
| CL72:7 | 0.6530 ± 0.3535 | 0.2954 ± 0.0965 | 0.45 | 0.095 |
| CL72:8 | 0.2240 ± 0.1846 | 0.1284 ± 0.0572 | 0.57 | 0.548 |
| CL72:9 | 0.0594 ± 0.0436 | 0.0166 ± 0.0129 | 0.28 | 0.095 |
| CL74:10 | 0.3583 ± 0.2385 | 0.1744 ± 0.0505 | 0.49 | 0.151 |
| CL74:11 | 0.0533 ± 0.0322 | 0.0463 ± 0.0212 | 0.87 | 0.841 |
| CL74:6 | 0.1387 ± 0.0707 | 0.0630 ± 0.0259 | 0.45 | 0.151 |
| CL74:7 | 1.3120 ± 0.8334 | 0.4510 ± 0.1315 | 0.34 | 0.032 |
| CL74:8 | 0.6022 ± 0.3808 | 0.3258 ± 0.1118 | 0.54 | 0.222 |
| CL74:9 | 0.7725 ± 0.4554 | 0.4454 ± 0.2166 | 0.58 | 0.222 |
| CL76:10 | 0.6819 ± 0.3867 | 0.3711 ± 0.1199 | 0.54 | 0.151 |
| CL76:11 | 0.6607 ± 0.3901 | 0.5453 ± 0.2352 | 0.83 | 1.000 |
| CL76:12 | 0.2718 ± 0.1597 | 0.1290 ± 0.0744 | 0.47 | 0.095 |
| CL76:7 | 0.0352 ± 0.0300 | 0.0099 ± 0.0039 | 0.28 | 0.151 |
| CL76:8 | 0.0241 ± 0.0101 | 0.0122 ± 0.0041 | 0.51 | 0.032 |
| CL76:9 | 1.0799 ± 0.7222 | 0.3646 ± 0.0997 | 0.34 | 0.016 |
| CL78:10 | 0.0870 ± 0.0427 | 0.0111 ± 0.0055 | 0.13 | 0.008 |
| CL78:11 | 0.1069 ± 0.0868 | 0.0636 ± 0.0226 | 0.59 | 0.548 |
| CL78:12 | 0.6438 ± 0.3496 | 0.2612 ± 0.0936 | 0.41 | 0.032 |
| CL78:13 | 0.4349 ± 0.3364 | 0.3408 ± 0.1150 | 0.78 | 1.000 |
| FFA16:0 | 137.4294 ± 25.9912 | 155.8586 ± 36.9344 | 1.13 | 0.841 |
| FFA18:0 | 349.1532 ± 44.9181 | 335.5336 ± 46.9602 | 0.96 | 1.000 |
| FFA18:1 | 151.1092 ± 33.0809 | 166.8604 ± 42.6452 | 1.10 | 0.690 |
| FFA18:2 | 10.3914 ± 2.7477 | 17.1140 ± 5.7792 | 1.65 | 0.095 |
| FFA18:3 | 0.5118 ± 0.0688 | 0.9118 ± 0.2647 | 1.78 | 0.016 |
| FFA20:4 | 494.4808 ± 38.2093 | 469.4820 ± 91.6727 | 0.95 | 1.000 |
| FFA20:5 | 0.7460 ± 0.2613 | 0.5900 ± 0.1849 | 0.79 | 0.548 |
| FFA22:6 | 38.1224 ± 9.7468 | 39.1916 ± 9.4906 | 1.03 | 1.000 |
| LPC16:0 | 7.4780 ± 0.8623 | 8.4314 ± 2.4886 | 1.13 | 0.421 |
| LPC18:0 | 5.1196 ± 1.1801 | 6.5746 ± 1.7968 | 1.28 | 0.222 |
| LPC18:1 | 3.1236 ± 0.3491 | 3.6128 ± 1.3769 | 1.16 | 0.548 |
| LPC18:2 | 0.0636 ± 0.0021 | 0.1602 ± 0.0750 | 2.52 | 0.008 |
| LPC18:3 | 0.3520 ± 0.0734 | 0.6062 ± 0.3708 | 1.72 | 0.222 |
| LPC20:4 | 0.2492 ± 0.0337 | 0.4682 ± 0.4010 | 1.88 | 0.310 |
| LPC20:5 | 0.0190 ± 0.0020 | 0.0448 ± 0.0199 | 2.36 | 0.008 |
| LPC22:6 | 0.5524 ± 0.1172 | 0.9386 ± 0.7113 | 1.70 | 0.421 |
| LPE16:0 | 7.8410 ± 0.5322 | 9.0590 ± 2.0226 | 1.16 | 0.310 |
| LPE18:0 | 35.5754 ± 2.3769 | 42.0300 ± 6.9148 | 1.18 | 0.222 |
| LPE18:1 | 5.4846 ± 1.1660 | 5.9880 ± 1.4963 | 1.09 | 0.690 |
| LPE18:2 | 0.0394 ± 0.0079 | 0.1316 ± 0.0530 | 3.34 | 0.008 |
| LPE20:4 | 5.3570 ± 0.6788 | 13.7026 ± 15.5660 | 2.56 | 0.056 |
| LPE20:5 | 0.0124 ± 0.0046 | 0.0232 ± 0.0289 | 1.87 | 0.841 |
| LPE22:6 | 12.5372 ± 1.4956 | 25.3200 ± 26.2019 | 2.02 | 0.421 |
| LPI16:0 | 0.2548 ± 0.1152 | 0.1790 ± 0.1108 | 0.70 | 0.310 |
| LPI18:0 | 2.1748 ± 1.0843 | 1.9612 ± 1.2456 | 0.90 | 0.548 |
| LPI18:1 | 0.2958 ± 0.1439 | 0.2232 ± 0.1363 | 0.75 | 0.421 |
| LPI20:4 | 0.9468 ± 0.4855 | 0.8410 ± 0.5492 | 0.89 | 0.690 |
| PC32:0 | 41.4728 ± 2.9520 | 42.6418 ± 4.3497 | 1.03 | 0.421 |
| PC32:1 | 9.3614 ± 0.9229 | 7.4508 ± 1.1688 | 0.80 | 0.095 |
| PC32:2 | 1.0852 ± 0.2329 | 1.0312 ± 0.1744 | 0.95 | 1.000 |
| PC34:0 | 48.6278 ± 5.5825 | 50.5504 ± 10.5024 | 1.04 | 0.548 |
| PC34:1 | 50.1506 ± 6.5600 | 47.5732 ± 8.4820 | 0.95 | 0.690 |
| PC34:2 | 6.1836 ± 1.2363 | 8.2960 ± 3.9926 | 1.34 | 0.548 |
| PC34:3 | 0.5810 ± 0.0584 | 1.0570 ± 0.3437 | 1.82 | 0.008 |
| PC34:4 | 0.4782 ± 0.0475 | 0.5626 ± 0.0542 | 1.18 | 0.056 |
| PC36:1 | 147.7930 ± 12.1471 | 142.8852 ± 20.4599 | 0.97 | 0.841 |
| PC36:2 | 13.4132 ± 1.7475 | 14.3198 ± 2.9252 | 1.07 | 1.000 |
| PC36:3 | 5.7530 ± 1.5642 | 7.0582 ± 3.3147 | 1.23 | 0.690 |
| PC36:4 | 25.6316 ± 2.9579 | 24.3024 ± 4.1217 | 0.95 | 0.841 |
| PC36:5 | 4.3060 ± 0.8804 | 3.8764 ± 0.5591 | 0.90 | 0.310 |
| PC36:6 | 0.5332 ± 0.0592 | 0.5330 ± 0.1026 | 1.00 | 1.000 |
| PC38:4 | 26.7166 ± 1.6406 | 27.8952 ± 3.7001 | 1.04 | 0.421 |
| PC38:5 | 13.5102 ± 1.9905 | 11.4548 ± 2.0972 | 0.85 | 0.310 |
| PC38:6 | 27.2926 ± 7.2114 | 23.3200 ± 4.4696 | 0.85 | 0.548 |
| PC38:7 | 4.0242 ± 0.3300 | 3.3360 ± 0.5534 | 0.83 | 0.095 |
| PC40:6 | 8.9108 ± 2.2709 | 7.9870 ± 1.6710 | 0.90 | 0.690 |
| PC40:7 | 6.8968 ± 1.7119 | 5.2852 ± 1.3004 | 0.77 | 0.151 |
| PC40:8 | 2.2404 ± 0.1594 | 3.3826 ± 0.5093 | 1.51 | 0.008 |
| PC42:10 | 5.8830 ± 0.2748 | 6.2486 ± 0.7987 | 1.06 | 0.310 |
| PE34:0 | 168.2216 ± 19.0829 | 170.0594 ± 16.7957 | 1.01 | 1.000 |
| PE34:1 | 68.6362 ± 7.7269 | 63.7058 ± 10.4875 | 0.93 | 0.548 |
| PE36:0 | 47.8896 ± 9.3977 | 53.1520 ± 7.1284 | 1.11 | 0.421 |
| PE36:1 | 224.6910 ± 39.1553 | 217.7296 ± 18.2041 | 0.97 | 0.548 |
| PE36:2 | 11.2638 ± 0.7525 | 16.5160 ± 2.9215 | 1.47 | 0.016 |
| PE36:3 | 22.1244 ± 4.2397 | 31.5954 ± 5.5377 | 1.43 | 0.056 |
| PE38:4 | 36.7408 ± 11.5431 | 39.8050 ± 2.8088 | 1.08 | 0.548 |
| PE38:5 | 272.2532 ± 55.2766 | 289.5912 ± 63.2640 | 1.06 | 0.690 |
| PE38:6 | 2004.5362 ± 405.0097 | 1939.4218 ± 379.6152 | 0.97 | 0.841 |
| PE40:6 | 66.0672 ± 12.7193 | 58.7214 ± 7.0869 | 0.89 | 0.421 |
| PE40:7 | 210.2932 ± 17.6327 | 220.9022 ± 49.1888 | 1.05 | 1.000 |
| PI32:0 | 2.4348 ± 1.0560 | 1.6948 ± 0.3995 | 0.70 | 0.310 |
| PI32:1 | 2.4516 ± 1.8607 | 1.3092 ± 0.5495 | 0.53 | 0.310 |
| PI34:0 | 2.2166 ± 0.9524 | 1.1866 ± 0.4216 | 0.54 | 0.095 |
| PI34:1 | 17.3360 ± 7.1439 | 14.4158 ± 1.1394 | 0.83 | 0.841 |
| PI34:2 | 2.1932 ± 0.6549 | 1.7404 ± 0.3622 | 0.79 | 0.421 |
| PI34:3 | 0.1034 ± 0.0214 | 0.1544 ± 0.0596 | 1.49 | 0.151 |
| PI36:0 | 2.0828 ± 0.6011 | 1.3532 ± 0.5343 | 0.65 | 0.151 |
| PI36:1 | 2.5316 ± 0.4414 | 1.8486 ± 0.4454 | 0.73 | 0.095 |
| PI36:2 | 0.8040 ± 0.2018 | 0.7040 ± 0.2810 | 0.88 | 0.421 |
| PI36:3 | 0.7850 ± 0.1085 | 0.7578 ± 0.2539 | 0.97 | 0.548 |
| PI36:4 | 24.0750 ± 2.2742 | 20.8328 ± 3.2350 | 0.87 | 0.151 |
| PI36:5 | 1.5464 ± 0.0789 | 1.4786 ± 0.3419 | 0.96 | 1.000 |
| PI38:4 | 52.4102 ± 5.7271 | 48.2986 ± 7.7205 | 0.92 | 0.310 |
| PI38:5 | 21.8356 ± 0.7909 | 19.4600 ± 3.9306 | 0.89 | 0.310 |
| PI38:6 | 2.1132 ± 1.1835 | 1.2886 ± 0.7111 | 0.61 | 0.310 |
| PI40:6 | 1.0472 ± 0.6387 | 0.5652 ± 0.1621 | 0.54 | 0.222 |
| PI40:7 | 0.3626 ± 0.1304 | 0.3384 ± 0.1565 | 0.93 | 0.690 |
| PI42:10 | 0.2008 ± 0.0289 | 0.1862 ± 0.0412 | 0.93 | 0.548 |
| TG42:0 | 0.5502 ± 0.1625 | 1.4090 ± 1.0965 | 2.56 | 0.421 |
| TG44:0 | 1.9804 ± 0.2691 | 4.1254 ± 2.7976 | 2.08 | 0.690 |
| TG46:0 | 6.5670 ± 0.3431 | 8.1940 ± 4.3248 | 1.25 | 0.690 |
| TG46:1 | 7.7206 ± 1.0467 | 12.6926 ± 6.4696 | 1.64 | 0.548 |
| TG46:2 | 3.5698 ± 0.7168 | 6.3622 ± 3.5546 | 1.78 | 0.421 |
| TG46:3 | 0.9800 ± 0.3563 | 1.6104 ± 0.9733 | 1.64 | 0.310 |
| TG48:0 | 59.5020 ± 6.2599 | 51.1544 ± 19.9843 | 0.86 | 0.310 |
| TG48:1 | 20.3998 ± 2.3476 | 21.4196 ± 7.0422 | 1.05 | 1.000 |
| TG48:2 | 13.8158 ± 2.5796 | 18.1914 ± 6.4242 | 1.32 | 0.548 |
| TG48:3 | 3.0978 ± 0.6462 | 5.1942 ± 2.4959 | 1.68 | 0.421 |
| TG48:4 | 0.6528 ± 0.6645 | 0.8460 ± 1.0140 | 1.30 | 1.000 |
| TG50:0 | 67.6798 ± 9.0533 | 60.5446 ± 19.4035 | 0.89 | 0.548 |
| TG50:1 | 90.0036 ± 7.1587 | 80.6276 ± 20.7424 | 0.90 | 0.421 |
| TG50:2 | 39.3730 ± 5.5137 | 43.2840 ± 8.0693 | 1.10 | 0.690 |
| TG50:3 | 15.8398 ± 3.2307 | 18.8506 ± 4.5407 | 1.19 | 0.310 |
| TG50:4 | 3.6112 ± 0.6009 | 5.4530 ± 1.1530 | 1.51 | 0.032 |
| TG50:5 | 0.7020 ± 0.0852 | 0.9884 ± 0.1933 | 1.41 | 0.016 |
| TG50:6 | 0.3144 ± 0.0434 | 0.3562 ± 0.0620 | 1.13 | 0.310 |
| TG52:0 | 31.8428 ± 2.6925 | 30.1024 ± 9.2258 | 0.95 | 1.000 |
| TG52:1 | 71.8840 ± 9.3980 | 71.8138 ± 14.6064 | 1.00 | 1.000 |
| TG52:2 | 96.3382 ± 11.6168 | 100.7082 ± 16.0833 | 1.05 | 0.690 |
| TG52:3 | 57.5826 ± 6.9379 | 74.0756 ± 14.6244 | 1.29 | 0.095 |
| TG52:4 | 33.8634 ± 5.0399 | 43.2744 ± 9.0603 | 1.28 | 0.095 |
| TG52:5 | 7.2188 ± 0.9809 | 10.1738 ± 2.4718 | 1.41 | 0.032 |
| TG52:6 | 5.2366 ± 0.2155 | 5.2488 ± 1.5163 | 1.00 | 0.222 |
| TG52:7 | 0.5520 ± 0.0594 | 0.6432 ± 0.1353 | 1.17 | 0.310 |
| TG54:0 | 2.3106 ± 0.2859 | 2.1612 ± 0.7228 | 0.94 | 1.000 |
| TG54:1 | 17.6682 ± 3.2248 | 16.8344 ± 4.9070 | 0.95 | 0.841 |
| TG54:2 | 30.1158 ± 6.1177 | 36.6660 ± 7.2832 | 1.22 | 0.222 |
| TG54:3 | 47.7162 ± 8.8437 | 65.1832 ± 14.0186 | 1.37 | 0.095 |
| TG54:4 | 53.4424 ± 5.4033 | 73.8930 ± 14.9406 | 1.38 | 0.056 |
| TG54:5 | 28.1110 ± 2.2187 | 46.2188 ± 21.3952 | 1.64 | 0.056 |
| TG54:6 | 70.7394 ± 7.3094 | 60.8330 ± 16.5915 | 0.86 | 0.151 |
| TG54:7 | 12.2504 ± 1.4429 | 11.4348 ± 2.1211 | 0.93 | 0.310 |
| TG54:8 | 0.8916 ± 0.0611 | 1.2074 ± 0.2965 | 1.35 | 0.222 |
| TG54:9 | 0.1214 ± 0.0217 | 0.2438 ± 0.0851 | 2.01 | 0.032 |
| TG56:10 | 0.3146 ± 0.0328 | 0.5274 ± 0.2172 | 1.68 | 0.032 |
| TG56:4 | 20.7686 ± 1.6508 | 21.8842 ± 3.7893 | 1.05 | 1.000 |
| TG56:5 | 21.6944 ± 1.5782 | 20.5690 ± 3.8588 | 0.95 | 0.548 |
| TG56:6 | 56.1484 ± 5.5958 | 51.7216 ± 9.8505 | 0.92 | 0.310 |
| TG56:7 | 73.3956 ± 8.6926 | 64.5728 ± 12.7247 | 0.88 | 0.310 |
| TG56:8 | 14.9806 ± 1.3273 | 22.3834 ± 8.1907 | 1.49 | 0.032 |
| TG56:9 | 1.5276 ± 0.2040 | 2.5752 ± 0.7539 | 1.69 | 0.008 |
| TG58:10 | 20.8396 ± 1.9294 | 23.5696 ± 6.8115 | 1.13 | 1.000 |
| TG58:11 | 1.1082 ± 0.1014 | 1.4314 ± 0.5080 | 1.29 | 0.310 |
| TG58:12 | 1.2672 ± 0.0804 | 1.1086 ± 0.4605 | 0.87 | 0.421 |
| TG58:6 | 8.7644 ± 0.6099 | 8.3714 ± 1.3612 | 0.96 | 0.421 |
| TG58:7 | 14.9456 ± 3.3622 | 14.1492 ± 2.3275 | 0.95 | 0.841 |
| TG58:8 | 18.2072 ± 2.5638 | 20.8120 ± 6.9788 | 1.14 | 0.841 |
| TG58:9 | 11.7814 ± 1.6463 | 15.1804 ± 3.3444 | 1.29 | 0.056 |
| TG60:10 | 19.8242 ± 1.1274 | 18.2906 ± 3.1593 | 0.92 | 0.310 |
| TG60:11 | 9.7582 ± 0.3820 | 9.8788 ± 2.1333 | 1.01 | 0.841 |
| TG60:12 | 33.7080 ± 5.5465 | 30.9666 ± 7.4176 | 0.92 | 0.421 |
| TG60:13 | 1.5774 ± 0.1719 | 1.2898 ± 0.3135 | 0.82 | 0.151 |

a Data were expressed as means ± standard deviations. Con, control group; HFD, high fat diet-STZ group.

b *P* value was calculated using Mann-Whitney *U*-test.

Abbreviations of lipid classes: TG, triacylglycerol; FFA, free fatty acid; PC, phosphatidylcholine; LPC, lysophosphatidylcholine; PE, phosphatidylethanolamine; LPE, lysophosphatidylethanolamine; PI, phosphatidylinositol; LPI, lysophosphatidylinositol; CL, cardiolipin.