**Table S2 Anionic metabolites**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| nmol/g (Cardiac tissue weight) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 　 | 　 | Group | **NC** | **HF** | **HF+Lina** | **HF vs HF+LIna (StudentT)** |
| Tube no. | NC1 | NC2 | NC3 | NC4 | NC5 | HF1 | HF2 | HF3 | HF4 | HF5 | HF+Lina1 | HF+Lina2 | HF+Lina3 | HF+Lina4 | HF+Lina5 | 　 |
| Ave m/z | Ave CorMT | 　 |
| [C06369](http://www.genome.jp/dbget-bin/www_bget?cpd:C06369) | 2-Deoxyglucose 6-phosphate | 243.0288  | 15.57  | 3.9  | 4.3  | 10  | 10  | 13  | 36  | 41  | 24  | 39  | 47  | 28  | 34  | 39  | 46  | 35  | p=NS |
| [C05984](http://www.genome.jp/dbget-bin/www_bget?cpd:C05984) | 2-Hydroxybutyrate | 103.0416  | 16.17  | 28  | 16  | 13  | 5.1  | 12  | 8.5  | 7.0  | 4.4  | 8.4  | 6.1  | 6.7  | 8.4  | 4.6  | 5.2  | 6.2  | p=NS |
| [C02630](http://www.genome.jp/dbget-bin/www_bget?cpd:C02630) | 2-Hydroxyglutarate | 147.0307  | 11.69  | 22  | 22  | 18  | 15  | 18  | 22  | 24  | 20  | 22  | 25  | 29  | 27  | 22  | 24  | 22  | p=NS |
| [C00631](http://www.genome.jp/dbget-bin/www_bget?cpd:C00631) | 2PG | 184.9872  | 11.05  | 45  | 36  | 47  | 30  | 39  | 28  | 30  | 45  | 46  | 44  | 32  | 43  | 32  | 48  | 34  | p=NS |
| [C01089](http://www.genome.jp/dbget-bin/www_bget?cpd:C01089) | 3-Hydroxybutyrate | 103.0418  | 16.59  | 75  | 45  | 29  | 32  | 54  | 39  | 32  | 21  | 45  | 26  | 27  | 41  | 38  | 31  | 36  | p=NS |
| [C00197](http://www.genome.jp/dbget-bin/www_bget?cpd:C00197) | 3PG | 184.9873  | 10.97  | 286  | 231  | 284  | 242  | 240  | 175  | 249  | 298  | 317  | 287  | 226  | 271  | 221  | 296  | 217  | p=NS |
| [C01879](http://www.genome.jp/dbget-bin/www_bget?cpd:C01879) | 5-Oxoproline | 128.0369  | 16.65  | 65  | 60  | 62  | 64  | 60  | 55  | 51  | 51  | 57  | 64  | 51  | 50  | 59  | 69  | 62  | p=NS |
| [C00345](http://www.genome.jp/dbget-bin/www_bget?cpd:C00345) | 6-Phosphogluconate | 275.0182  | 12.30  | 16  | 35  | 18  | 15  | 15  | 20  | 13  | 15  | 20  | 18  | 17  | 22  | 35  | 20  | 24  | p=NS |
| [C00024](http://www.genome.jp/dbget-bin/www_bget?cpd:C00024) | Acetyl CoA | 403.5572  | 15.49  | 4.7  | 5.4  | 6.0  | 7.6  | 3.0  | 3.1  | 7.6  | 11  | 3.5  | 3.3  | 3.4  | 3.4  | 1.9  | 5.4  | 2.8  | p=NS |
| [C00054](http://www.genome.jp/dbget-bin/www_bget?cpd:C00054) | Adenosine 3',5'-diphosphate | 426.0228  | 12.90  | 42  | 28  | 48  | 37  | 39  | 43  | 37  | 35  | 44  | 38  | 41  | 62  | 41  | 57  | 54  | p=NS |
| [C03794](http://www.genome.jp/dbget-bin/www_bget?cpd:C03794) | Adenylosuccinate | 462.0673  | 12.71  | 235  | 177  | 161  | 198  | 249  | 160  | 107  | 107  | 198  | 182  | 120  | 220  | 258  | 177  | 194  | p=NS |
| [C00008](http://www.genome.jp/dbget-bin/www_bget?cpd:C00008) | ADP | 426.0233  | 14.72  | 661  | 670  | 678  | 655  | 635  | 562  | 691  | 739  | 750  | 707  | 582  | 609  | 624  | 701  | 587  | p=NS |
| [C00498](http://www.genome.jp/dbget-bin/www_bget?cpd:C00498) | ADP-glucose | 588.0767  | 19.41  | 6.7  | 6.9  | 8.3  | 6.3  | 8.2  | 5.1  | 6.2  | 4.9  | 7.4  | 6.0  | 7.5  | 7.3  | 7.1  | 6.4  | 5.6  | p=NS |
| [C00301](http://www.genome.jp/dbget-bin/www_bget?cpd:C00301) | ADP-ribose | 558.0642  | 18.90  | 38  | 54  | 44  | 41  | 42  | 43  | 38  | 45  | 37  | 38  | 33  | 38  | 45  | 42  | 34  | p=NS |
| [C00020](http://www.genome.jp/dbget-bin/www_bget?cpd:C00020) | AMP | 346.0572  | 16.91  | 1339  | 2755  | 2060  | 1987  | 1864  | 1379  | 3870  | 3378  | 2072  | 1887  | 1245  | 1614  | 2336  | 2074  | 1628  | p=NS |
| [C00002](http://www.genome.jp/dbget-bin/www_bget?cpd:C00002) | ATP | 505.9887  | 14.03  | 87  | 66  | 92  | 89  | 80  | 48  | 127  | 123  | 114  | 85  | 68  | 73  | 62  | 105  | 68  | p=NS |
| [C08261](http://www.genome.jp/dbget-bin/www_bget?cpd:C08261) | Azelate | 187.0991  | 13.71  | 2.8  | 2.9  | 4.1  | 4.9  | 3.7  | 3.4  | 2.4  | 2.7  | 3.2  | 3.5  | 3.4  | 3.3  | 3.5  | 3.5  | 3.0  | p=NS |
| [C00307](http://www.genome.jp/dbget-bin/www_bget?cpd:C00307) | CDP-choline | 547.1210  | 27.57  | 37  | 36  | 41  | 35  | 26  | 21  | 20  | 34  | 14  | 23  | 16  | 20  | 12  | 11  | 15  | p=NS |
| [C00417](http://www.genome.jp/dbget-bin/www_bget?cpd:C00417) | cis-Aconitate | 173.0099  | 10.01  | 2.4  | 2.5  | 2.7  | 3.2  | 2.1  | 2.5  | 2.5  | 3.8  | 1.5  | 1.8  | 2.2  | 1.5  | 1.5  | 2.2  | 1.4  | p=NS |
| [C00158](http://www.genome.jp/dbget-bin/www_bget?cpd:C00158) | Citrate | 191.0212  | 10.20  | 107  | 101  | 106  | 138  | 81  | 83  | 71  | 108  | 64  | 79  | 92  | 65  | 75  | 89  | 75  | p=NS |
| [C00055](http://www.genome.jp/dbget-bin/www_bget?cpd:C00055) | CMP | 322.0452  | 16.36  | 19  | 37  | 30  | 21  | 22  | 18  | 51  | 34  | 29  | 21  | 24  | 22  | 27  | 29  | 23  | p=NS |
| [C00128](http://www.genome.jp/dbget-bin/www_bget?cpd:C00128) | CMP-N-acetylneuraminate | 613.1404  | 19.91  | 14  | 13  | 12  | 11  | 12  | 13  | 15  | 18  | 16  | 15  | 14  | 14  | 14  | 15  | 13  | p=NS |
| [C00010](http://www.genome.jp/dbget-bin/www_bget?cpd:C00010) | CoA | 382.5518  | 15.01  | 67  | 95  | 75  | 84  | 87  | 38  | 114  | 115  | 88  | 66  | 39  | 51  | 74  | 80  | 44  | p=NS |
| [C00346](http://www.genome.jp/dbget-bin/www_bget?cpd:C00346) | Ethanolamine phosphate | 140.0127  | 20.47  | 389  | 324  | 323  | 342  | 289  | 272  | 313  | 335  | 296  | 328  | 265  | 253  | 276  | 310  | 270  | p=NS |
| [C00354](http://www.genome.jp/dbget-bin/www_bget?cpd:C00354) | F1,6P | 338.9898  | 12.34  | 517  | 300  | 296  | 441  | 295  | 181  | 554  | 676  | 626  | 705  | 346  | 473  | 201  | 612  | 426  | p=NS |
| [C00085](http://www.genome.jp/dbget-bin/www_bget?cpd:C00085) | F6P | 259.0238  | 15.83  | 668  | 595  | 290  | 424  | 304  | 250  | 419  | 507  | 404  | 597  | 590  | 483  | 208  | 562  | 905  | p=NS |
| [C00016](http://www.genome.jp/dbget-bin/www_bget?cpd:C00016) | FAD | 784.1499  | 20.98  | 77  | 67  | 68  | 74  | 69  | 67  | 75  | 74  | 70  | 71  | 67  | 70  | 71  | 74  | 71  | p=NS |
| [C00122](http://www.genome.jp/dbget-bin/www_bget?cpd:C00122) | Fumarate | 115.0053  | 10.26  | 358  | 210  | 251  | 277  | 363  | 279  | 162  | 149  | 300  | 254  | 209  | 313  | 310  | 234  | 268  | p=NS |
| [C00103](http://www.genome.jp/dbget-bin/www_bget?cpd:C00103) | G1P | 259.0236  | 15.61  | 206  | 283  | 97  | 127  | 106  | 98  | 305  | 422  | 148  | 198  | 170  | 158  | 78  | 181  | 268  | p=NS |
| [C00092](http://www.genome.jp/dbget-bin/www_bget?cpd:C00092) | G6P | 259.0240  | 15.95  | 2608  | 2481  | 1216  | 1638  | 1246  | 1009  | 1598  | 2084  | 1560  | 2302  | 2358  | 1920  | 859  | 2249  | 3711  | p=NS |
| [C00035](http://www.genome.jp/dbget-bin/www_bget?cpd:C00035) | GDP | 442.0180  | 14.90  | 24  | 27  | 30  | 27  | 29  | 25  | 40  | 30  | 37  | 30  | 31  | 25  | 29  | 33  | 28  | p=NS |
| [C00096](http://www.genome.jp/dbget-bin/www_bget?cpd:C00096) | GDP-mannose | 604.0712  | 19.51  | 6.4  | 7.2  | 4.7  | 6.3  | 6.3  | 6.3  | 7.7  | 6.3  | 7.3  | 7.0  | 7.5  | 6.5  | 7.7  | 4.1  | 6.7  | p=NS |
| [C00257](http://www.genome.jp/dbget-bin/www_bget?cpd:C00257) | Gluconate | 195.0524  | 20.02  | 8.2  | 7.6  | 10  | 8.3  | 7.8  | 7.7  | 7.2  | 7.2  | 7.7  | 11  | 8.3  | 12  | 8.6  | 7.6  | 8.2  | p=NS |
| [C00489](http://www.genome.jp/dbget-bin/www_bget?cpd:C00489) | Glutarate | 131.0366  | 11.71  | 3.1  | 2.4  | 2.9  | 2.7  | 2.7  | 2.2  | N.D. | 1.3  | 2.0  | 2.7  | 1.8  | 3.4  | 2.4  | 2.8  | 2.3  | p=NS |
| [C00093](http://www.genome.jp/dbget-bin/www_bget?cpd:C00093) | Glycerophosphate | 171.0083  | 13.65  | 2611  | 1291  | 2198  | 2301  | 2715  | 2515  | 1205  | 1268  | 2092  | 2130  | 2294  | 2752  | 1722  | 2527  | 2599  | p=NS |
| [C00144](http://www.genome.jp/dbget-bin/www_bget?cpd:C00144) | GMP | 362.0513  | 17.23  | 239  | 241  | 244  | 222  | 227  | 239  | 236  | 236  | 238  | 241  | 235  | 217  | 224  | 254  | 240  | p=NS |
| [C00044](http://www.genome.jp/dbget-bin/www_bget?cpd:C00044) | GTP | 521.9824  | 14.32  | 6.1  | 5.5  | 10  | 8.2  | 9.2  | N.D. | 18  | 11  | 11  | 7.9  | N.D. | N.D. | N.D. | 9.9  | 6.5  | p=NS |
| [C05582](http://www.genome.jp/dbget-bin/www_bget?cpd:C05582) | Homovanillate | 181.0509  | 19.64  | 14  | 12  | 9.2  | 8.2  | 13  | 6.4  | 4.8  | 4.4  | 6.5  | 9.8  | 7.2  | 9.8  | 7.1  | 9.0  | 12  | p=NS |
| [C00130](http://www.genome.jp/dbget-bin/www_bget?cpd:C00130) | IMP | 347.0413  | 16.33  | 4709  | 3270  | 4078  | 4109  | 4063  | 4453  | 1968  | 1962  | 3740  | 4044  | 4733  | 4027  | 3683  | 4210  | 4120  | p=NS |
| [C05123](http://www.genome.jp/dbget-bin/www_bget?cpd:C05123) | Isethionate | 124.9924  | 14.05  | 18  | 19  | 19  | 19  | 18  | 15  | 18  | 16  | 17  | 26  | 16  | 14  | 17  | 22  | 17  | p=NS |
| [C00311](http://www.genome.jp/dbget-bin/www_bget?cpd:C00311) | Isocitrate | 191.0213  | 9.97  | 6.9  | 21  | 6.1  | 7.5  | 4.5  | 11  | 24  | 34  | 5.4  | 10  | 14  | 5.0  | 16  | 6.6  | 10  | p=NS |
| [C00186](http://www.genome.jp/dbget-bin/www_bget?cpd:C00186) | Lactate | 89.0268  | 14.80  | 6783  | 6219  | 5206  | 5773  | 5484  | 7397  | 4147  | 7274  | 6662  | 8472  | 8475  | 6269  | 6751  | 6178  | 6017  | p=NS |
| [C00711](http://www.genome.jp/dbget-bin/www_bget?cpd:C00711) | Malate | 133.0161  | 10.71  | 611  | 402  | 426  | 497  | 616  | 477  | 322  | 296  | 519  | 471  | 403  | 532  | 568  | 430  | 485  | p=NS |
| [C01042](http://www.genome.jp/dbget-bin/www_bget?cpd:C01042) | N-Acetylaspartate | 174.0425  | 12.36  | 18  | 20  | 20  | 16  | 15  | 14  | 12  | 11  | 11  | 13  | 12  | 12  | 16  | 12  | 10  | p=NS |
| [C04501](http://www.genome.jp/dbget-bin/www_bget?cpd:C04501) | N-Acetylglucosamine 1-phosphate | 300.0489  | 16.50  | 6.5  | 5.5  | 5.3  | 6.1  | 4.1  | 6.3  | 5.4  | 5.2  | 5.3  | 5.7  | 5.7  | 8.1  | 5.5  | 5.6  | 5.5  | p=NS |
| [C00357](http://www.genome.jp/dbget-bin/www_bget?cpd:C00357) | N-Acetylglucosamine 6-phosphate | 300.0496  | 17.23  | 3.2  | 2.9  | 3.5  | 2.8  | 3.5  | 4.3  | 2.1  | 2.5  | 4.4  | 3.3  | 4.8  | 4.0  | 4.0  | 3.4  | 6.0  | p=NS |
| [C00003](http://www.genome.jp/dbget-bin/www_bget?cpd:C00003) | NAD+ | 662.1015  | 29.99  | 299  | 372  | 301  | 317  | 294  | 164  | 441  | 316  | 332  | 273  | 184  | 257  | 245  | 335  | 226  | p=NS |
| [C00004](http://www.genome.jp/dbget-bin/www_bget?cpd:C00004) | NADH | 664.1174  | 19.86  | 54  | 54  | 58  | 70  | 60  | 29  | 79  | 36  | 75  | 52  | 25  | 51  | 39  | 58  | 31  | p=NS |
| [C00006](http://www.genome.jp/dbget-bin/www_bget?cpd:C00006) | NADP+ | 742.0688  | 16.79  | 68  | 49  | 62  | 54  | 58  | 48  | 56  | 38  | 62  | 53  | 43  | 56  | 51  | 78  | 52  | p=NS |
| [C00005](http://www.genome.jp/dbget-bin/www_bget?cpd:C00005) | NADPH | 371.5393  | 14.35  | 20  | 12  | 27  | 25  | 20  | 9.3  | 23  | 7.0  | 29  | 10  | 9.4  | 19  | 9.7  | 20  | 11  | p=NS |
| [C00864](http://www.genome.jp/dbget-bin/www_bget?cpd:C00864) | Pantothenate | 218.1045  | 21.94  | 35  | 30  | 40  | 31  | 40  | 40  | 41  | 48  | 34  | 70  | 52  | 58  | 52  | 58  | 72  | p=NS |
| [C00074](http://www.genome.jp/dbget-bin/www_bget?cpd:C00074) | PEP | 166.9765  | 10.75  | 13  | 10  | 9.5  | 8.9  | 9.6  | 8.7  | 7.3  | 13  | 14  | 15  | 14  | 11  | 10  | 13  | 9.7  | p=NS |
| [C05682](http://www.genome.jp/dbget-bin/www_bget?cpd:C05682) | Phosphonoacetate | 138.9819  | 11.00  | 6.6  | 6.6  | 8.4  | N.D. | 6.1  | N.D. | 8.6  | 6.6  | 7.3  | N.D. | 8.4  | 8.5  | N.D. | N.D. | N.D. | p=NS |
| [C00199](http://www.genome.jp/dbget-bin/www_bget?cpd:C00199) | Ru5P | 229.0131  | 14.62  | 312  | 209  | 262  | 249  | 267  | 322  | 103  | 136  | 197  | 249  | 315  | 246  | 244  | 232  | 291  | p=NS |
| [C05382](http://www.genome.jp/dbget-bin/www_bget?cpd:C05382) | S7P | 289.0336  | 16.31  | 17  | 8.4  | 14  | 11  | 12  | 18  | 6.5  | 5.5  | 9.8  | 12  | 17  | 10  | 12  | 12  | 20  | p=NS |
| [C00042](http://www.genome.jp/dbget-bin/www_bget?cpd:C00042) | Succinate | 117.0206  | 10.77  | 296  | 309  | 278  | 312  | 362  | 284  | 326  | 260  | 284  | 292  | 215  | 365  | 289  | 274  | 293  | p=NS |
| [C06337](http://www.genome.jp/dbget-bin/www_bget?cpd:C06337) | Terephthalate | 165.0204  | 11.72  | 1.4  | 1.3  | 1.6  | 1.9  | 1.8  | 0.93  | 1.3  | 0.77  | 2.1  | 1.3  | 1.4  | 1.3  | 1.3  | 1.5  | 0.79  | p=NS |
| [C01620](http://www.genome.jp/dbget-bin/www_bget?cpd:C01620) | Threonate | 135.0317  | 17.14  | 93  | 84  | 101  | 98  | 95  | 85  | 108  | 79  | 97  | 107  | 89  | 94  | 87  | 105  | 96  | p=NS |
| [C00689](http://www.genome.jp/dbget-bin/www_bget?cpd:C00689) | Trehalose 6-phosphate | 421.0808  | 19.04  | 2.1  | 3.0  | N.D. | 2.5  | 2.4  | 2.7  | 5.2  | 3.3  | N.D. | N.D. | 3.3  | N.D. | 2.2  | N.D. | N.D. | p=NS |
| [C00015](http://www.genome.jp/dbget-bin/www_bget?cpd:C00015) | UDP | 402.9945  | 14.03  | 9.1  | 7.1  | 6.6  | 6.5  | 5.6  | 5.5  | 7.4  | 5.9  | 7.9  | 8.8  | 7.0  | 6.1  | 4.6  | 5.6  | 4.3  | p=NS |
| [C00029](http://www.genome.jp/dbget-bin/www_bget?cpd:C00029) | UDP-glucose | 565.0479  | 18.52  | 11  | 30  | 16  | 23  | 12  | 8.8  | 26  | 11  | 12  | 16  | 3.6  | 8.4  | 14  | 14  | N.D. | p=NS |
| [C00043](http://www.genome.jp/dbget-bin/www_bget?cpd:C00043) | UDP-N-acetylglucosamine | 606.0750  | 19.02  | 68  | 73  | 60  | 62  | 61  | 63  | 73  | 72  | 66  | 66  | 68  | 61  | 72  | 67  | 73  | p=NS |
| [C00105](http://www.genome.jp/dbget-bin/www_bget?cpd:C00105) | UMP | 323.0291  | 16.04  | 98  | 172  | 136  | 112  | 106  | 95  | 210  | 167  | 137  | 109  | 99  | 113  | 131  | 125  | 101  | p=NS |
| [C00366](http://www.genome.jp/dbget-bin/www_bget?cpd:C00366) | Urate | 167.0230  | 17.85  | 15  | 16  | 18  | 16  | 17  | 20  | 12  | 14  | 19  | 19  | 24  | 13  | 20  | 17  | 16  | p=NS |

Other anionis metabolites in the cardiac tissues of mice fed on a normal chow (NC) (n=3), high fat diet (HF) (n=3) and high fat diet+linagliptin (HF+Lina)(n=3) groups.

Data were analyzed by the 2-tailed Student’s t-test.