

**Table S1.** List of metabolites selected to evaluate the effect of testosterone therapy and their percentage increase or decrease before and after treatment. The values are reported as percentual difference compared to control ( not included in table). *Green*, increased molecules; *red* decreased molecules.

| Molecule                                   | M.W.     | Hypog. (%) | Post testost. (%) |
|--|----------|------------|-------------------|
| D-Glucose 6-Phosphate (260,14)             | 260,14   | 100        | 105               |
| beta-D-Fructose 1,6-bisphosphate (340.114) | 340.114  | 350        | 300               |
| D-Glyceraldehyde 3-phosphate (170,06)      | 170,06   | 5          | 10                |
| Phosphoenolpyruvate (168,04)               | 168,04   | -1         | 20                |
| Lactate (90,08)                            | 90,08    | 10         | 280               |
| D-Glucono-1,5-lactone (178,14)             | 178,14   | 70         | 30                |
| D-Ribulose 5-phosphate (230,11)            | 230,11   | 60         | 15                |
| D-Erythrose 4-phosphate (200,084)          | 200,084  | -20        | -98,9             |
| 6-P-D-Gluconate (276,135)                  | 276,135  | 90         | 10                |
| Sedoheptulose 1,7-bisphosphate (370.14)    | 370.14   | 100        | -75               |
| NADH (663,43)                              | 663,43   | 280        | 80                |
| NAD (663,43)                               | 663,43   | 10         | -20               |
| Glutathione disulfide (610.6)              | 610.6    | 98         | -90               |
| Glycerol-3-Phosphate (172,074)             | 172,074  | -40        | 20                |
| Dyhydroxyacetone-3P (170,06)               | 170,06   | 5          | -30               |
| Mevalonate (148,16)                        | 148,16   | 290        | 700               |
| Acetyl-CoA (809,57)                        | 809,57   | -48        | 20                |
| Acetyl-carnitine (203,236)                 | 203,236  | -20        | -90               |
| Citrate (192,124)                          | 192,124  | -99,6      | -99,55            |
| Oxaloacetate (132,07)                      | 132,07   | -18        | -1                |
| Malate (134,0874)                          | 134,0874 | 300        | 25                |
| Succinate (118,09)                         | 118,09   | 10         | -5                |
| 2-oxoglutarato (146,11)                    | 146,11   | 4          | 1                 |
| Oxalosuccinate (190.11)                    | 190.11   | 5          | -15               |
| cis-Aconitate (174,108)                    | 174,108  | -20        | -100              |
| Glutamate (147,13)                         | 147,13   | -48        | 90                |
| Glutamine (146,14)                         | 146,14   | -5         | 2                 |
| AMP (347,2212)                             | 347,2212 | -40        | -20               |
| ATP (507,18)                               | 507,18   | -1         | -60               |
| Aspartate (133,11)                         | 133,11   | -60        | -55               |
| Leucine/isoleucine (131,17)                | 131,17   | -15        | -47               |
| Valine (117,15)                            | 117,15   | -15        | -40               |
| Tyrosine (181,19)                          | 181,19   | -1         | -48               |
| Phenylalanine (165,19)                     | 165,19   | -5         | -48               |
| Cysteine (121,16)                          | 121,16   | 200        | -85               |
| Tryptophan (204,23)                        | 204,23   | -2         | -50               |
| Methionine (149,21)                        | 149,21   | -1         | -25               |

|                      |          |     |     |
|----------------------|----------|-----|-----|
| Alanine (89,09)      | 89,09    | 280 | -55 |
| Serine (105,09)      | 105,09   | 299 | 60  |
| Threonine (119,1192) | 119,1192 | -5  | 50  |
| Asparagine (132,12)  | 132,12   | -97 | -90 |
| L-Arginine (174,2)   | 174,2    | 60  | 200 |
| Proline (115,13)     | 115,13   | 50  | 47  |
| L-Lysine (146,19)    | 146,19   | 50  | 25  |
| Histidine (155,1546) | 155,1546 | -99 | 110 |
| Uracil (112,09)      | 112,09   | -48 | -40 |
| Carnosine (226,3)    | 226,3    | -55 | -18 |