**Supplementary Table 1** The biochemical index analysis of control, YHS and YCHT groups

| Index | ALT (U/L) | AST (U/L) | ALP (U/L) | D-Bili (µmol/L) | T-Bili (µmol/L) |
|-------|-----------|-----------|-----------|----------------|-----------------|
| Control | 96.81 ±1.37×E | 165.78 ±3.72×E | 96.99 ±5.14 | 1.90 ±0.44 | 1.97 ±0.11 |
| YHS | 214.35 ±6.81×E** | 320.89 ±2.13×E** | 225.35 ±9.69×E** | 3.62 ±0.25** | 3.80 ±0.16** |
| YCHT | 105.12 ±2.23×E## | 240.50 ±7.64×E# | 96.07 ±4.36## | 2.29 ±1.18# | 2.45 ±1.18# |

| Index | γ-GT (U/gprot) | TBA (µmol/L) | T-SOD (U/mgprot) | MDA (nmol/mgprot) | GSH-Px (µmol/L) |
|-------|----------------|-------------|------------------|-------------------|-----------------|
| Control | 8.34 ±1.17 | 5.58 ±1.09 | 23.07 ±2.79 | 102.49 ±4.01 | 217.29 ±2.33×E |
| YHS | 11.02 ±1.96* | 8.72 ±0.98** | 20.93 ±2.31 | 212.37 ±7.50×E | 117.63 ±2.95×E** |
| YCHT | 8.46 ±0.80# | 6.31 ±1.85## | 21.51 ±3.81 | 97.98 ±7.22## | 213.70 ±6.94×E# |

The clinical biochemical index analysis results are expressed as mean±SD, n=12

*P<0.05, **P<0.01, control vs YHS; #P<0.05, ##P<0.01, YHS vs YCHT
**Supplementary Table. 2** Identification and trends of serum potential biomarkers in YHS mice

| NO | Rt (min) | m/z determined | m/z calculated | Error (mDa) | Ion form | Molecular Formula | Metabolite Name | Trend | T' TEST |
|----|----------|----------------|----------------|-------------|----------|-------------------|-----------------|-------|---------|
| 1  | 8.73     | 772.5930       | 771.5778       | 0.2         | [M+H]^+  | C₄₃H₆₀NO₈P        | PC(15:0/20:2(11Z,14Z)) | ↓     | 1.594×E⁻³ |
| 2  | 0.60     | 130.0499       | 129.9426       | 0.5         | [M+H]^+  | C₂₆H₃₀NO₃         | Pyroglutamic acid | ↓     | 1.654×E⁻² |
| 3  | 2.20     | 249.1251       | 248.1161       | 2.9         | [M+H]^+  | C₁₃H₁₈NO₃O₃       | 6-Hydroxy melatonin | ↑     | 4.540×E⁻⁵ |
| 4  | 6.25     | 546.3539       | 545.3481       | -2.8        | [M+H]^+  | C₂₃H₂₃NO₈-P       | LysoPC(20:3(5Z,8Z,11Z)) | ↓     | 1.466×E⁻⁶ |
| 5  | 8.19     | 512.5064       | 511.4964       | 3.1         | [M+H]^+  | C₁₂H₂₈NO₄           | Cer(d18:0/14:0) | ↓     | 6.952×E⁻⁹ |
| 6  | 8.78     | 719.5690       | 718.5536       | -1.4        | [M+H]^+  | C₄₇H₈₂O₅           | DG(22:4(7Z,10Z,13Z,16Z)/22:5(4Z,7Z,10Z ,13Z,16Z)+0) | ↓     | 1.981×E⁻² |
| 7  | 1.98     | 194.0794       | 193.0739       | -0.1        | [M+H]^+  | C₁₀H₁₁NO₃         | Phenylacetylglucose | ↑     | 4.578×E⁻³ |
| 8  | 2.23     | 411.2492       | 410.2433       | -3.4        | [M+H]^+  | C₁₀H₁₀O₄-P         | LPA(0/0/16:0) | ↑     | 4.933×E⁻² |
| 9  | 2.69     | 121.0649       | 120.0575       | 0.9         | [M+H]^+  | C₆H₁₂O            | Phenylacetaldelyde | ↑     | 4.446×E⁻³ |
| 10 | 3.06     | 136.0761       | 135.0684       | 2.7         | [M+H]^+  | C₅H₁₀NO            | 2-Phenylethalamide | ↑     | 2.989×E⁻² |
| 11 | 8.31     | 556.5300       | 555.5227       | 0.1         | [M+H]^+  | C₁₂H₂₉NO₄           | Cer(18:0/16:0) | ↑     | 5.923×E⁻³ |
| 12 | 8.89     | 770.5690       | 769.5622       | -0.5        | [M+H]^+  | C₁₄H₁₈O₄-P         | PC(15:0/20:3(5Z,8Z,11Z)) | ↓     | 1.618×E⁻² |
| 13 | 2.25     | 758.5692       | 757.5622       | -0.3        | [M+H]^+  | C₁₂H₁₈O₄P          | PC(14:0/20:2(11Z,14Z)) | ↑     | 3.516×E⁻³ |
| 14 | 5.46     | 224.0562       | 223.0481       | 3.9         | [M+H]^+  | C₁₀H₈NO₃         | 4-(2-Amino-3-hydroxyphenyl)-2,4- dioxobutanoic acid | ↑     | 2.124×E⁻³ |
| 15 | 6.99     | 538.3877       | 537.3794       | 1.9         | [M+H]^+  | C₂₆H₂₆NO₄-P        | LysoPE(0/0/22:0) | ↓     | 1.504×E⁻² |
| 16 | 1.72     | 209.0939       | 208.0848       | -1.5        | [M+H]^+  | C₁₀H₁₀O₃P         | Formyl-5-hydroxykynurenine | ↑     | 3.473×E⁻⁴ |
| 17 | 2.32     | 185.0827       | 184.0736       | 2.9         | [M+H]^+  | C₆H₁₂O₄           | Vanillylglucol | ↑     | 2.157×E⁻³ |
| 18 | 8.34     | 802.6350       | 801.6248       | 4.6         | [M+H]^+  | C₄₃H₆₀NO₈-P        | PC(15:0/22:1(13Z)) | ↓     | 1.049×E⁻³ |
| 19 | 1.90     | 163.0383       | 164.0473       | 1.6         | [M-H]-   | C₆H₁₀O₃         | Phenylpyruvic acid | ↑     | 3.070×E⁻⁴ |
| 20 | 1.98     | 193.0349       | 194.0427       | -2.6        | [M-H]-   | C₆H₁₀O₃          | D-Glucuronic acid | ↑     | 4.211×E⁻² |
| 21 | 8.49     | 790.5418       | 791.5465       | 3.2         | [M-H]-   | C₄₃H₆₀NO₈-P        | PC(15:0/22:6(4Z,7Z,10Z,13Z,16Z,19Z)) | ↑     | 4.768×E⁻² |
| 22 | 6.19     | 480.3096       | 481.3168       | 0.1         | [M-H]-   | C₂₃H₂₈NO₄-P        | LysoPC(15:0) | ↓     | 1.101×E⁻² |

↑ Compared with control group, the level of metabolites in YHS group were increased
↓ Compared with control group, the level of metabolites in YHS group were decreased
### Supplementary Table 3 Relative signal intensities of metabolic biomarkers.

| NO | Groups                          | Control          | YHS       | YCHT       |
|----|--------------------------------|------------------|-----------|------------|
| 1  | PC(15:0/20:2(11Z,14Z))         | 8.66×E^6         | 2.66×E^6  | 7.83×E^6   |
|    |                                | ±8.80×E^3        | ±3.18×E^5 | ±1.71×E^6  |
| 2  | Pyroglutamic acid               | 7.40×E^4         | 3.11×E^4  | 5.10×E^4   |
|    |                                | ±1.38×E^4        | ±2.01×E^3 | ±7.32×E^3  |
| 3  | 6-Hydroxymelatonin             | 5.99×E^3         | 1.28×E^4  | 9.36×E^3   |
|    |                                | ±2.58×E^3        | ±3.22×E^3 | ±4.51×E^3  |
| 4  | LysoPC(20:3(5Z,8Z,11Z))         | 1.22×E7          | 2.38×E6   | 9.93×E6    |
|    |                                | ±1.07×E6         | ±2.37×E5  | ±5.14×E5   |
| 5  | Cer(d18:0/14:0)                 | 8.39×E^6         | 3.85×E^4  | 6.11×E^6   |
|    |                                | ±1.90×E^6        | ±1.03×E^4 | ±6.11×E^5  |
| 6  | DG(22:4(7Z,10Z,13Z,16Z)/22:5(4Z,7Z,10Z,13Z,16Z)/0:0) | 8.64×E^5         | 3.72×E^3  | 4.64×E^5   |
|    |                                | ±1.81×E^5        | ±1.05×E^5 | ±3.04×E^3  |
| 7  | Phenylacetylglycine             | 1.78×E^3         | 5.27×E^3  | 2.69×E^3   |
|    |                                | ±1.17×E^3        | ±1.97×E^3 | ±1.68×E^3  |
| 8  | LPA(0:0/16:0)                   | 1.47×E^6         | 7.38×E^4  | 3.29×E^4   |
|    |                                | ±6.80×E^3        | ±3.07×E^4 | ±1.67×E^4  |
| 9  | Phenylacetaldheyde             | 2.20×E^3         | 3.99×E^3  | 2.22×E^3   |
|    |                                | ±1.44×E^3        | ±1.18×E^3 | ±1.73×E^3  |
| 10 | 2-Phenylacetamide              | 4.03×E^7         | 1.51×E^3  | 1.03×E^3   |
|    |                                | ±1.71×E^2        | ±2.88×E^2 | ±5.16×E^2  |
| 11 | Cer(t18:0/16:0)                 | 3.39×E^6         | 8.80×E^5  | 6.41×E^5   |
|    |                                | ±1.82×E^4        | ±3.71×E^3 | ±2.99×E^4  |
| 12 | PC(15:0/20:3(5Z,8Z,11Z))        | 1.85×E^6         | 3.74×E^3  | 1.73×E^6   |
|    |                                | ±3.64×E^5        | ±6.77×E^4 | ±8.89×E^5  |
| 13 | PC(14:0/20:2(11Z,14Z))          | 2.68×E^8         | 4.56×E^7  | 1.24×E^8   |
|    |                                | ±5.19×E^7        | ±1.74×E^7 | ±1.16×E^8  |
| 14 | 4-(2-Amino-3-hydroxyphenyl)-2,4-dioxobutanoic acid | 5.37×E^5         | 3.03×E^3  | 1.78×E^5   |
|    |                                | ±4.06×E^4        | ±1.02×E^5 | ±1.48×E^4  |
| 15 | LysoPE(0:0/22:0)                | 1.47×E^7         | 5.31×E^6  | 6.04×E^6   |
|    |                                | ±3.14×E^6        | ±8.74×E^5 | ±5.43×E^5  |
| 16 | Formyl-5-hydroxykynurenamin     | 5.33×E^3         | 1.42×E^4  | 8.43×E^3   |
|    |                                | ±2.68×E^3        | ±4.48×E^3 | ±3.82×E^3  |
| 17 | Vanylglycol                    | 9.96×E^2         | 1.19×E^4  | 1.69×E^3   |
|    |                                | ±9.53×E^2        | ±2.98×E^3 | ±1.20×E^3  |
| 18 | PC(15:0/22:1(13Z))             | 1.90×E^6         | 5.99×E^3  | 1.19×E^4   |
|    |                                | ±6.71×E^3        | ±2.83×E^3 | ±3.92×E^3  |
| 19 | Phenylpyruvic acid             | 6.49×E^3         | 2.57×E^4  | 1.36×E^4   |
|    |                                | ±1.46×E^3        | ±1.70×E^4 | ±6.60×E^3  |
| 20 | D-Glucuronic acid              | 2.67×E^7         | 1.58×E^3  | 5.04×E^3   |
|    |                                | ±4.62            | 5.06×E^2  | 1.09×E^3   |
| 21 | PC(15:0/22:6(4Z,7Z,10Z,13Z,16Z,19Z)) | 3.94×E^6         | 4.05×E^6  | 2.90×E^7   |
|    |                                | ±1.02×E^7        | ±1.07×E^6 | ±4.48×E^6  |
| 22 | LysoPC(15:0)                   | 1.52×E^7         | 2.41×E^5  | 5.25×E^5   |
|    |                                | ±1.10×E^7        | ±5.21×E^5 | ±4.36×E^5  |

Data are expressed as mean±SD. YHS group compared with control group: *p < 0.05, **p < 0.01; and YCHT group compared with YHS group: #p < 0.05, ##p < 0.01.