|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | *p*(control,NRAS) | *p*(control,KRAS) | *p*(control,HRAS) | *p*(NRAS,KRAS) | *p*(NRAS,HRAS) | *p*(KRAS,HRAS) |
| Alanine | **1.4 x 10-7** | **4.7 x 10-3** | **3.4 x 10-5** | 8.3 x 10-2 | 4.1 | 7.4 x 10-2 |
| Aspartate | 3.4 | **1.2 x 10-4** | 0.31 | **6.7 x 10-4** | 0.61 | 0.64 |
| Choline | **1.2 x 10-5** | **9.2 x 10-6** | **3.1 x 10-5** | 4.7 | 3.9 | 3.0 |
| Choline  Alfoscerate | 1.7 x 10-2 | 5.2 | 0.32 | **1.1 x 10-5** | 0.20 | 5.5 x 10-2 |
| Creatine | 1.8 x 10-2 | **3.9 x 10-3** | 2.1 x 10-2 | 1.1 | 3.0 | 4.5 |
| Fumarate | **2.4 x 10-3** | **3.1 x 10-4** | **4.4 x10-3** | 3.4 | 1.6 | 0.22 |
| Lactate | 1.4 x 10-2 | **3.7 x 10-3** | 1.2 x 10-3 | 5.0 | 1.5 | 1.5 |
| Leucine | 1.1 x 10-2 | 0.10 | **6.5 x 10-3** | 3.1 | 0.33 | 0.18 |
| Myo-inositol | **6.0 x 10-10** | **1.2 x 10-6** | **5.6 x 10-9** | **3.7 x 10-3** | 1.9 | 1.1 x 10-2 |
| NAA | **3.7 x 10-3** | **4.0 x 10-3** | 1.3 | 4.1 | 0.26 | 0.37 |
| NAC | **2.5 x 10-4** | **5.9 X 10-4** | **4.1 X 10-4** | 0.61 | **7.9 x 10-3** | 0.30 |
| Phe | **3.3 x 10-6** | 2.7 x 10-2 | 0.11 | 0.35 | 5.0 | 1.6 |
| PC | **8.1 x 10-7** | **1.7 x 10-6** | **8.1 x 10-7** | **2.9 x 10-8** | **2.5 x 10-4** | **1.9 x 10-5** |
| Proline | **1.8 x 10-4** | **1.2 x 10-4** | 2.7 x 10-2 | 4.2 | 4.3 x 10-2 | 2.1 x 10-2 |
| Taurine | **6.0 x 10-10** | **1.0 x 10-6** | **7.3 x 10-7** | 1.5 x 10-2 | 4.7 | 3.5 x 10-2 |
| Tyrosine | **6.5 x 10-3** | 4.7 x 10-2 | **8.2 x 10-4** | 1.0 | 1.8 x 10-2 | 1.5 x 10-2 |
| UDP-X | **1.4 x 10-7** | **6.9 x 10-3** | **4.1 x 10-3** | 9.0 x 10-2 | **1.0 x 10-5** | 0.2’6 |
| Valine## | 0.93 | 1.9 | 2.5 x 10-2 | 4.1 | 0.11 | 8.6 x 10-2 |

**Table S1**