Supplementary Material

Rice bran and Probiotics Alter the Porcine Large Intestinal and Serum Metabolomes for Enhanced Protection against Human Rotavirus Diarrhea

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**Supplementary Table 1. Large intestinal content and serum lipids in pigs consuming probiotics in the presence and absence of rice bran.**

| **Metabolite\*** | **HMDB\*\*** | **Large Intestinal Contents** | **Serum** |
| --- | --- | --- | --- |
|  |  | **Fold Difference\*\*\*** | **p-value** | **Fold Difference** | **p-value** |
| 1-linoleoylglycerol (18:2) | - | 320.72 ↑ | 1.04E-08 | - |
| 2-oleoylglycerol (18:1) | - | 293.40 ↑ | 3.04E-10 | - |
| 2-linoleoylglycerol (18:2) | [11538](http://www.hmdb.ca/metabolites/HMDB11538) | 187.09 ↑ | 9.27E-10 | - |
| 1-oleoyl-3-linoleoyl-glycerol (18:1/18:2) | - | 177.20 ↑ | 2.26E-08 | - |
| 9,10-dihydroxyoctadecenoic acid (DiHOME) | [04704](http://www.hmdb.ca/metabolites/HMDB04704) | 111.38 ↑ | 1.90E-07 | 9.63 ↑ | 0.00016 |
| 1-oleoylglycerol (18:1) | [11567](http://www.hmdb.ca/metabolites/HMDB11567) | 93.63 ↑ | 3.37E-07 | - |
| glycocholenate sulfate | - | 71.16 ↑ | 0.011 | - |
| 1-linolenoylglycerol (18:3) | [11569](http://www.hmdb.ca/metabolites/HMDB11569) | 45.81 ↑ | 9.59E-07 | - |
| taurochenodeoxycholate | [00951](http://www.hmdb.ca/metabolites/HMDB00951) | 16.34 ↑ | 0.012 | - |
| beta-sitosterol | [00852](http://www.hmdb.ca/metabolites/HMDB00852) | 15.59 ↑ | 4.72E-11 | - |
| glycolithocholate sulfate | [02639](http://www.hmdb.ca/metabolites/HMDB02639) | 12.09 ↑ | 0.0088 | - |
| 1-palmitoyl-3-linoleoyl-glycerol (16:0/18:2) | - | 10.51 ↑ | 0.00013 | - |
| 1-oleoyl-2-linoleoyl-glycerol (18:1/18:2) | - | 9.37 ↑ | 0.00021 | 1.79 ↑ | 0.033 |
| 1-palmitoylglycerol (16:0) | [31074](http://www.hmdb.ca/metabolites/HMDB31074) | 9.33 ↑ | 0.00014 | - |
| glycohyodeoxycholate | - | 9.27 ↑ | 0.046 | - |
| sphingomyelin (d18:1/21:0, d17:1/22:0, d16:1/23:0) | - | 8.89 ↑ | 0.0010 | - |
| behenoyl sphingomyelin (d18:1/22:0) | - | 7.98 ↑ | 0.0012 | - |
| 1-palmitoyl glycerophosphatidic acid (GPA) (16:0) | [00327](http://www.hmdb.ca/metabolites/HMDB00327) | 7.27 ↑ | 0.011 | - |
| 2-palmitoylglycerol (16:0) | [11533](http://www.hmdb.ca/metabolites/HMDB11533) | 7.08 ↑ | 6.33E-05 | - |
| 1-palmitoleoylglycerol (16:1) | - | 6.70 ↑ | 0.00015 | - |
| palmitoyl dihydrosphingomyelin (d18:0/16:0) | - | 6.48 ↑ | 0.0028 | - |
| sphingomyelin (d18:1/14:0, d16:1/16:0) | - | 6.33 ↑ | 0.0010 | - |
| 1,2-dioleoyl-glycerophosphocholine (GPC) (18:1/18:1) | - | 5.88 ↑ | 0.0035 | 0.65 ↓ | 0.014 |
| sphingomyelin (d18:1/15:0, d16:1/17:0) | - | 5.75 ↑ | 0.0021 | - |
| 1-palmitoyl-2-linoleoyl-glycerol (16:0/18:2) | 05207, 07103 | 5.71 ↑ | 0.0031 | - |
| stearoyl sphingomyelin (d18:1/18:0) | [01348](http://www.hmdb.ca/metabolites/HMDB01348) | 5.61 ↑ | 0.0074 | - |
| palmitoyl sphingomyelin (d18:1/16:0) | - | 5.42 ↑ | 0.017 | - |
| 12,13-dihydroxyoctadecenoic acid (DiHOME) | [04705](http://www.hmdb.ca/metabolites/HMDB04705) | 5.26 ↑ | 0.0012 | 15.03 ↑ | 0.00031 |
| heptanedioate (pimelate) | 00857 | 5.17 ↑ | 0.00033 | 1.58 ↑ | 0.010 |
| malonate | [00691](http://www.hmdb.ca/metabolites/HMDB00691) | 4.81 ↑ | 1.26E-06 | - |
| linoleoyl ethanolamide | [12252](http://www.hmdb.ca/metabolites/HMDB12252) | 4.42 ↑ | 0.0014 | - |
| glycerol | [00131](http://www.hmdb.ca/metabolites/HMDB00131) | 4.32 ↑ | 0.00088 | - |
| nonanedioate (azelate) | 00784 | 4.23 ↑ | 0.0015 | 1.73 ↑ | 0.023 |
| stearoylcarnitine | [00848](http://www.hmdb.ca/metabolites/HMDB00848) | 4.13 ↑ | 0.044 | - |
| 13 + 9 Hydroxyoctadecadienoic acid (13+9 HODE) | - | 3.93 ↑ | 0.010 | - |
| sphingomyelin (d18:1/17:0, d17:1/18:0, d19:1/16:0) | - | 3.88 ↑ | 0.0059 | - |
| 1-palmitoyl-2-linoleoyl-glycerophosphocholine (GPC) (16:0/18:2) | - | 3.66 ↑ | 0.039 | - |
| 16-hydroxypalmitate | 06294 | 3.45 ↑ | 0.00037 | - |
| choline phosphate | 01565 | 3.43 ↑ | 0.0027 | 1.61 ↑ | 0.046 |
| campesterol | [02869](http://www.hmdb.ca/metabolites/HMDB02869) | 3.17 ↑ | 0.00047 | 10.69 ↑ | 1.58E-06 |
| 2-palmitoleoylglycerol (16:1) | - | 3.00 ↑ | 0.015 | - |
| 1-palmitoyl-2-oleoyl-glycerophosphoglycerol (GPG) (16:0/18:1) | - | 2.47 ↑ | 0.0023 | - |
| mevalonate | [00227](http://www.hmdb.ca/metabolites/HMDB00227) | 2.44 ↑ | 0.013 | - |
| 1-pentadecanoylglycerol (15:0) | - | 2.34 ↑ | 0.0074 | - |
| 1-oleoyl-2-linoleoyl-glycerophosphocholine (GPC) (18:1/18:2) | - | 1.84 ↑ | 0.033 | - |
| sphingomyelin (d18:1/24:1, d18:2/24:0) | - | 1.77 ↑ | 0.0079 | - |
| sphingomyelin (d18:1/20:0, d16:1/22:0) | - | 1.65 ↑ | 0.032 | - |
| stearate (18:0) | [00827](http://www.hmdb.ca/metabolites/HMDB00827) | 0.65 ↓ | 0.015 | - |
| phytosphingosine | [04610](http://www.hmdb.ca/metabolites/HMDB04610) | 0.63 ↓ | 0.034 | - |
| palmitate (16:0) | [00220](http://www.hmdb.ca/metabolites/HMDB00220) | 0.59 ↓ | 0.0087 | - |
| N-palmitoyl-sphingosine (d18:1/16:0) | [04949](http://www.hmdb.ca/metabolites/HMDB04949) | 0.59 ↓ | 0.025 | - |
| 3-hydroxylaurate | 00387 | 0.58 ↓ | 0.014 | 0.60 ↓ | 0.046 |
| oleate (vaccenate) (18:1) | - | 0.56 ↓ | 0.030 | - |
| sphingosine | [00252](http://www.hmdb.ca/metabolites/HMDB00252) | 0.53 ↓ | 0.029 | - |
| nonadecanoate (19:0) | [00772](http://www.hmdb.ca/metabolites/HMDB00772) | 0.52 ↓ | 0.022 | - |
| sphinganine | [00269](http://www.hmdb.ca/metabolites/HMDB00269) | 0.52 ↓ | 0.034 | - |
| N-palmitoyl-sphinganine (d18:0/16:0) | [11760](http://www.hmdb.ca/metabolites/HMDB11760) | 0.50 ↓ | 0.0070 | - |
| palmitoleoylcarnitine | - | 0.50 ↓ | 0.042 | - |
| eicosenoate (20:1) | [02231](http://www.hmdb.ca/metabolites/HMDB02231) | 0.47 ↓ | 0.024 | - |
| 2-hydroxystearate | - | 0.44 ↓ | 0.00034 | - |
| margarate (17:0) | [02259](http://www.hmdb.ca/metabolites/HMDB02259) | 0.41 ↓ | 0.0062 | - |
| 17-methylstearate | - | 0.40 ↓ | 0.0038 | - |
| cholesterol | [00067](http://www.hmdb.ca/metabolites/HMDB00067) | 0.36 ↓ | 0.00052 | - |
| docosapentaenoate (n6 DPA; 22:5n6) | 01976 | 0.34 ↓ | 0.032 | - |
| lactosyl-N-palmitoyl-sphingosine | - | 0.33 ↓ | 0.041 | - |
| 2-methylmalonyl carnitine | [13133](http://www.hmdb.ca/metabolites/HMDB13133) | 0.29 ↓ | 0.0012 | 1.52 ↑ | 0.034 |
| malonylcarnitine | [02095](http://www.hmdb.ca/metabolites/HMDB02095) | 0.28 ↓ | 1.23E-06 | - |
| 2-hydroxypalmitate | 31057 | 0.27 ↓ | 3.07E-05 | - |
| pentadecanoate (15:0) | [00826](http://www.hmdb.ca/metabolites/HMDB00826) | 0.26 ↓ | 0.00066 | - |
| docosapentaenoate (n3 DPA; 22:5n3) | 01976 | 0.26 ↓ | 0.0048 | - |
| 5-dodecenoate (12:1n7) | 00529 | 0.26 ↓ | 0.00045 | - |
| eicosapentaenoate (EPA; 20:5n3) | 01999 | 0.26 ↓ | 0.041 | 0.63 ↓ | 0.010 |
| myristoleate (14:1n5) | 02000 | 0.25 ↓ | 0.0018 | - |
| 15-methylpalmitate | - | 0.24 ↓ | 0.00014 | - |
| tetradecanoic acid (myristate, 14:0) | 00806 | 0.24 ↓ | 0.00082 | - |
| caprate (10:0) | 00511 | 0.24 ↓ | 0.0012 | - |
| N-palmitoylglycine | - | 0.23 ↓ | 0.00017 | - |
| suberylglycine | [00953](http://www.hmdb.ca/metabolites/HMDB00953) | 0.23 ↓ | 0.0013 | - |
| 3-hydroxybutyrate (BHBA) | [00357](http://www.hmdb.ca/metabolites/HMDB00357) | 0.23 ↓ | 0.026 | - |
| palmitoleate (16:1n7) | 03229 | 0.22 ↓ | 0.00026 | - |
| dihomo-linoleate (20:2n6) | 05060 | 0.22 ↓ | 0.00028 | - |
| dihomo-linolenate (20:3n3 or n6) | 02925 | 0.22 ↓ | 0.00047 | - |
| N-palmitoyltaurine | - | 0.21 ↓ | 0.0020 | - |
| propionylcarnitine | [00824](http://www.hmdb.ca/metabolites/HMDB00824) | 0.20 ↓ | 0.00015 | - |
| pristanate | [00795](http://www.hmdb.ca/metabolites/HMDB00795) | 0.20 ↓ | 0.0027 | - |
| 7-hydroxycholesterol (alpha or beta) | - | 0.20 ↓ | 0.00010 | - |
| 3b-hydroxy-5-cholenoic acid | [00308](http://www.hmdb.ca/metabolites/HMDB00308) | 0.19 ↓ | 3.69E-05 | - |
| laurate (12:0) | 00638 | 0.18 ↓ | 8.17E-05 | - |
| docosadienoate (22:2n6) | 61714 | 0.16 ↓ | 6.88E-06 | - |
| 3-hydroxymyristate | - | 0.16 ↓ | 7.73E-06 | - |
| 7-ketolithocholate | [00467](http://www.hmdb.ca/metabolites/HMDB00467) | 0.16 ↓ | 0.0083 | - |
| erucate (22:1n9) | [02068](http://www.hmdb.ca/metabolites/HMDB02068) | 0.16 ↓ | 4.83E-05 | 0.66 ↓ | 0.037 |
| hyocholate | [00760](http://www.hmdb.ca/metabolites/HMDB00760) | 0.15 ↓ | 0.030 | - |
| adrenate (22:4n6) | 02226 | 0.15 ↓ | 1.60E-05 | - |
| 5,8,11-Eicosatrienoic acid (mead acid; 20:3n9) | 10378 | 0.15 ↓ | 0.00017 | 0.57 ↓ | 0.031 |
| beta-muricholate | [00415](http://www.hmdb.ca/metabolites/HMDB00415) | 0.13 ↓ | 0.049 | - |
| nervonate (24:1n9) | 02368 | 0.12 ↓ | 4.76E-06 | - |
| cholate sulfate | - | 0.12 ↓ | 5.26E-05 | - |
| 13-methylmyristate | - | 0.11 ↓ | 0.00010 | - |
| 5alpha-androstan-3alpha,17beta-diol disulfate | - | 0.11 ↓ | 0.014 | - |
| N-oleoyltaurine | - | 0.084 ↓ | 0.022 | - |
| cholate | [00619](http://www.hmdb.ca/metabolites/HMDB00619) | 0.061 ↓ | 0.028 | - |
| chenodeoxycholate | [00518](http://www.hmdb.ca/metabolites/HMDB00518) | 0.054 ↓ | 0.0078 | - |
| hyodeoxycholate | [00733](http://www.hmdb.ca/metabolites/HMDB00733) | 0.054 ↓ | 0.0040 | - |
| caprylate (8:0) | 00482 | - | 1.33 ↑ | 0.029 |
| suberate (octanedioate) | 00893 | - | 1.72 ↑ | 0.018 |
| 2-hydroxyglutarate | 00606 | - | 0.64 ↓ | 0.0087 |
| 3-methyladipate | 00555 | - | 0.44 ↓ | 0.00086 |
| 2-aminoheptanoate | - | - | 2.81 ↑ | 0.013 |
| 2-aminooctanoate | 00991 | - | 0.45 ↓ | 0.016 |
| butyrylcarnitine | [02013](http://www.hmdb.ca/metabolites/HMDB02013) | - | 0.73 ↓ | 0.041 |
| 3-hydroxybutyrylcarnitine (2) | - | - | 0.66 ↓ | 0.036 |
| alpha-hydroxycaproate | 01624 | - | 0.73 ↓ | 0.039 |
| 2-hydroxyoctanoate | 02264 | - | 0.61 ↓ | 0.039 |
| palmitoyl ethanolamide | [02100](http://www.hmdb.ca/metabolites/HMDB02100) | - | 0.60 ↓ | 0.035 |
| 1-palmitoyl-2-linoleoyl-glycerophosphoinositol (GPI) (16:0/18:2) | - | - | 1.54 ↑ | 0.012 |
| 1-stearoyl-2-linoleoyl-glycerophosphoinositol (GPI) (18:0/18:2) | - | - | 1.33 ↑ | 0.019 |
| 1-palmitoyl-2-stearoyl-glycerophosphocholine (GPC) (16:0/18:0) | - | - | 1.33 ↑ | 0.017 |
| 1-stearoyl-2-oleoyl-glycerophosphocholine (GPC) (18:0/18:1) | - | - | 0.73 ↓ | 0.045 |
| 1-palmitoyl-2-palmitoleoyl-glycerophosphocholine (GPC) (16:0/16:1) | - | - | 0.71 ↓ | 0.028 |
| 1-palmitoyl-2-linolenoyl-glycerophosphocholine (GPC) (16:0/18:3) | - | - | 0.59 ↓ | 0.015 |
| 1-(1-enyl-stearoyl)-2-linoleoyl-glycerophosphoethanolamine (GPE) (P-18:0/18:2) | - | - | 1.55 ↑ | 0.021 |
| glycochenodeoxycholate | [00637](http://www.hmdb.ca/metabolites/HMDB00637) | - | 0.48 ↓ | 0.021 |

\* Table displays lipid metabolites with a statistically-significant fold difference between Pro+RB and Pro in both LIC and serum matrices.
\*\* HMDB refers to the Human Metabolome Database, and access numbers are provided for each metabolite identified in the database.
\*\*\* For each metabolite, fold difference was calculated by dividing the scaled relative abundance of Pro+RB by Pro, where ↑ indicates that the metabolite had a higher scaled relative abundance in Pro+RB compared to Pro, and ↓ indicates the metabolite had a lower scaled relative abundance in Pro+RB compared to Pro.