Table S1: Compositions of the mouse diets used in the study.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Ingredient(g/Kg Diet) | NFD  (normal diet) | HFD  (high-fat diet) | 500IU  25OHD3-HFD | 10,00IU  25OHD3-HFD |
| Casein | 200 | 200 | 200 | 200 |
| Lactose | 3 | 3 | 3 | 3 |
| Starch | 150 | - | - | - |
| Maltodextrin | 75 | 100 | 100 | 100 |
| Sucrose | 173 | 91.5 | 91.5 | 91.5 |
| Cellulose | 50 | 50 | 50 | 50 |
| Pork lard | - | 33.50 | 33.50 | 33.50 |
| Soybean oil | 20 | 40 | 40 | 40 |
|  |  |  |  |  |
| Mineral Mix S10026a | 10 | 10 | 10 | 10 |
| Vitamin Mix V10001b | 10 | 10 | 10 | 10 |
| Calcium phosphate, monobasic | 2.65 | 2.65 | 2.65 | 2.65 |
| Calcium carbonate | 1.70 | 1.70 | 1.70 | 1.70 |
| Energy Kcal/g diet(%) |  |  |  |  |
| Protein | 20 | 20 | 20 | 20 |
| Carbohydrate | 70 | 30 | 30 | 30 |
| Fat | 10 | 50 | 50 | 50 |

aThe mineral mix composition was as follows (amount in 10 g):0.5 g Mg, 0.3 g S, 1.0 g Na, 1.6 g, Cl, 6.0 mg Cu, 0.2 mg I, 45.0 mg Fe, 59 mg Mn, 0.2 mg Se, and 29 mg Zn.

b The vitamin mix composition was as follows (amount in 10 g): 4000 IU vitamin A palmitate,

1000 IU vitamin D3, 50 IU vitamin E acetate, 0.5 mg menadione sodium bisulfite, 0.2 mg biotin

(1.0%), 10 μg cyanocobalamin (0.1%), 2 mg folic acid, 30 mg nicotinic acid, 16 mg calcium

pantothenate, 7 mg pyridoxine-HCl, 6 mg riboflavin, and 6 mg thiamin HC.

Table S2. Primers for Real-Time PCR.

|  |  |
| --- | --- |
| Genes | Sequences |
| Cyp2R1 | Forward:5＇-TGGAGGCATATCAACTGTCGTT-3＇  Reverse: 5＇-TGTTAACAGCCAACCTTCTGTGA-3＇ |
| Cyp27B1 | Forward:5＇-GAGGCAGTGAGTCGGTTCTC-3＇  Reverse: 5＇-CCCAAAGCTGCCAGACCATA-3＇ |
| Cyp24A1 | Forward:5＇-CTGCCCCATTGACAAAAGGC-3＇  Reverse: 5＇-GAGTCTCACCGTCGGTCATC-3＇ |
| Cyp11a1 | Forward:5＇-AAGACCTGGAAGGACCATGC-3＇  Reverse: 5＇-CACCAGGGTACTGGCTGAAG-3＇ |
| Cyp17a1 | Forward: 5＇-GCTTTCCTGGTGCACAATCC-3＇ Reverse: 5＇-AGGAGGTGAGTCCGGTCATT-3＇ |