**Title:** Genome-wide association study of bone mineral density trait among three pig breeds.

**List of authors:** Beijia Jiang, Mengfen Wang, Zhenshuang Tang, Xiaoyong Du, Shuaifei Feng, Guanjun Ma, Dengdeng Ye, Huijun Cheng, Haiyan Wang, and Xiangdong Liu.

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**Figure S1** The density of SNPs with 1 Mb window size on each chromosome of three populatiions (Duroc, Landrace, Yorkshire). SNP: single nucleotide polymorphism. The color represents the density of the SNPs, where the density is higher according to the color from dark green to red.

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**Figure S2** Three categories of gene ontology (GO) terms for significant genes of three populations (Duroc, Landrace, Yorkshire). The number of genes indicates the quantity of genes associated with these pathways; CC= cellular component; MF= molecular function; BP= biological process.

**Table S1** *The**criteria for judging the firmness of limb-and-hoof of pig*

|  |  |  |  |
| --- | --- | --- | --- |
| Type  | Criteria | SOS(m/sec) | Symbol |
| Strong bone |  SOS>A+SD | >4471 | ++ |
| Normal bone |  A-SD≤SOS≤A+SD | 4062~4471 | + |
| Less bone | A-2.5SD≤SOS≤A-SD | 3755~4062 | – |
| Osteoporosis |  SOS≤A-2.5SD | <3755 | – – |

 SOS: the speed of sound (m/sec);

 A: the mean value of SOS in metatarsal bone of experimental animals;

 SD: the standard deviation of SOS in metatarsal bone of experimental animals.

**Table S2** *Descriptive**statistic of* *metatarsal BMD in different breeds (Duroc, Landrace and Yorkshire)*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Breed | Number | Max | Min | Mean | SD | C.V% |
| Duroc | 115 | 4603 | 3496 | 4130  | 210.8  | 5.10  |
| Landrace | 243 | 4695 | 3547 | 4299  | 218.2  | 5.07 |
| Yorkshire | 454 | 4671 | 3388 | 4276  | 180.8  | 4.23 |

 Max: the maximum speed of sound in the metatarsal;

 Min: the minimum speed of sound in the metatarsal;

 Mean: the average speed of sound in the metatarsal;

 SD: standard deviation to the speed of sound in the metatarsal;

 C.V%: coefficient of variation to the speed of sound in the metatarsal;

BMD: bone mineral density.

**Table S3** *Multiple comparison of metatarsal BMD in different breeds (Duroc, Landrace and Yorkshire)*

|  |  |  |
| --- | --- | --- |
| Multiple comparison | P value | Significance |
| Landrace-Duroc | 0.00000001 | \*\*\* |
| Yorkshire-Duroc | 0.00000001 | \*\*\* |
| Yorkshire-Landrace | 0.2971036 | – |

 “\*\*\*”: indicates that there is highly significant difference;

 “–”: indicates that there is no significant;

BMD: bone mineral density.

**Table S4** *Descriptive**statistic of metatarsal BMD in different age groups of three populations (Duroc, Landrace and Yorkshire)*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Age group | Number | Max | Min | Mean | SD | C.V% |
| group 1(≤350days) | 61 | 4630 | 3603 | 4204 | 210.5 | 5.00 |
| group 2(351~450days) | 174 | 4665 | 3683 | 4237 | 183.0 | 4.00 |
| group 3(451~550days) | 162 | 4669 | 3496 | 4186 | 193.9 | 4.60 |
| group 4(551~650days) | 28 | 4666 | 3893 | 4269 | 188.2 | 4.40 |
| group 5(651~750days) | 98 | 4665 | 3388 | 4301 | 209.4 | 4.90 |
| group 6(751~850days) | 139 | 4687 | 3827 | 4319 | 180.0 | 4.20 |
| group 7(851~1050days) | 21 | 4631 | 3800 | 4205 | 216.7 | 5.20 |
| group 8(951~456days) | 86 | 4695 | 3740 | 4330 | 216.6 | 5.00 |
| group 9(≥1050days) | 45 | 4692 | 3837 | 4349 | 221.8 | 5.10 |

 Max: the maximum speed of sound in the metatarsal;

 Min: the minimum speed of sound in the metatarsal;

 Mean: the average speed of sound in the metatarsal;

 SD: standard deviation to the speed of sound in the metatarsal;

 C.V%: coefficient of variation to the speed of sound in the metatarsal;

BMD: bone mineral density.

**Table S5** *Multiple comparison of metatarsal BMD in different age groups* *of three populations (Duroc, Landrace and Yorkshire)*

|  |  |  |
| --- | --- | --- |
| Multiple comparison | P value | Significance |
| group 5-group 8 | 0.9877787  | – |
| group 1-group 8 | 0.0044830  | \*\*\* |
| group 4-group 8 | 0.8913598  | – |
| group 9-group 8 | 0.9987130  | – |
| group 2-group 8 | 0.1062110  | – |
| group 7-group 8 | 0.1821489  | – |
| group 6-group 8 | 0.9999795  | – |
| group 3-group 8 | 0.0000022  | \*\*\* |
| group 1-group 5 | 0.0646703  | – |
| group 4-group 5 | 0.9978325  | – |
| group 9-group 5 | 0.9220529  | – |
| group 2-group 5 | 0.1977847  | – |
| group 7-group 5 | 0.5166563  | – |
| group 6-group 5 | 0.9990826  | – |
| group 3-group 5 | 0.0002298  | \*\*\* |
| group 4-group 1 | 0.8767120  | – |
| group 9-group 1 | 0.0061021  | \*\*\* |
| group 2-group 1 | 0.9708434  | – |
| group 7-group 1 | 1.0000000  | – |
| group 6-group 1 | 0.0048309  | \*\*\* |
| group 3-group 1 | 0.9996370  | – |
| group 9-group 4 | 0.7611092  | – |
| group 2-group 4 | 0.9966305  | – |
| group 7-group 4 | 0.9685465  | – |
| group 6-group 4 | 0.9523782  | – |
| group 3-group 4 | 0.5044319  | – |
| group 2-group 9 | 0.0204138  | – |
| group 7-group 9 | 0.1266292  | – |
| group 6-group 9 | 0.9939408  | – |
| group 3-group 9 | 0.0000424  | \*\*\* |
| group 7-group 2 | 0.9986906  | – |
| group 6-group 2 | 0.0080161  | \*\*\* |
| group 3-group 2 | 0.3154370  | – |
| group 6-group 7 | 0.2434819  | – |
| group 3-group 7 | 0.9999820  | – |
| group 3-group 6 | 0.0000003  | \*\*\* |

 “\*\*\*”: indicates that there is highly significant difference;

 “–”: indicates that there is no significant;

BMD: bone mineral density.

The results of multiple comparisons among different age groups showed that age group 1 has very significant difference in metatarsal BMD with age group 6, age group 8 and age group 9 respectively (P < 0.01). And there is very significant difference in metatarsal BMD between age group 2 and age group 6 (P < 0.01). Also, age group 3 has significant difference in metatarsal BMD with age group 5, age group 6 and age group 8 (P < 0.01).

**Table S6** *Descriptive**statistic of metatarsal BMD in different parities* *of three populations (Duroc, Landrace and Yorkshire)*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parity | Number | Max | Min | Mean | SD | C.V% |
| 1 | 239 | 4665 | 3496 | 4221 | 196.2 | 4.6 |
| 2 | 172 | 4669 | 3547 | 4203 | 191.5 | 4.6 |
| 3 | 123 | 4665 | 3388 | 4291 | 201.1 | 4.7 |
| 4 | 144 | 4687 | 3800 | 4306 | 184.9 | 4.3 |
| 5 | 93 | 4695 | 3740 | 4334 | 220.7 | 5.1 |
| 6 | 3 | 4490 | 4029 | 4277 | 232.0 | 5.0 |
| 7 | 25 | 4692 | 3837 | 4355 | 223.1 | 5.1 |
| 8 | 13 | 4627 | 3849 | 4365 | 214.4 | 4.9 |

 Max: the maximum speed of sound in the metatarsal;

 Min: the minimum speed of sound in the metatarsal;

 Mean: the average speed of sound in the metatarsal;

 SD: standard deviation to the speed of sound in the metatarsal;

 C.V%: coefficient of variation to the speed of sound in the metatarsal;

BMD: bone mineral density.

**Table S7** *Multiple comparison of metatarsal BMD in different parities* *of three populations (Duroc, Landrace and Yorkshire)*

|  |  |  |
| --- | --- | --- |
| Multiple comparison | P value | Significance |
| Parity5-parity8 | 0.9995687 | – |
| Parity1-Parity8 | 0.1791312 | – |
| Parity4-Parity8 | 0.9710349 | – |
| Parity2-Parity8 | 0.8673200 | – |
| Parity7-Parity8 | 0.9999999 | – |
| Parity6-Parity8 | 0.9972505 | – |
| Parity3-Parity8 | 0.9067174 | – |
| Parity1-Parity5 | 0.0000961 | \*\*\* |
| Parity4-Parity5 | 0.9624716 | – |
| Parity2-Parity5 | 0.0000088 | \*\*\* |
| Parity7-Parity5 | 0.9997763 | – |
| Parity6-Parity5 | 0.9996963 | – |
| Parity3-Parity5 | 0.7527822 | – |
| Parity4-Parity1 | 0.0014018 | \*\*\* |
| Parity2-Parity1 | 0.9832989 | – |
| Parity7-Parity1 | 0.0291177 | – |
| Parity6-Parity1 | 0.9997211 | – |
| Parity3-Parity1 | 0.0342428 | – |
| Parity2-Parity4 | 0.0001257 | \*\*\* |
| Parity7-Parity4 | 0.9462015 | – |
| Parity6-Parity4 | 0.9999970 | – |
| Parity3-Parity4 | 0.9985407 | – |
| Parity7-Parity2 | 0.0082589 | \*\*\* |
| Parity6-Parity2 | 0.9982342 | – |
| Parity3-Parity2 | 0.0044785 | \*\*\* |
| Parity6-Parity7 | 0.9982054 | – |
| Parity3-Parity7 | 0.8170136 | – |
| Parity3-Parity6 | 1.0000000 | – |

 “\*\*\*”: indicates that there is highly significant difference;

 “–”: indicates that there is no significant difference;

BMD: bone mineral density.

The result showed that the metatarsal BMD between the first parity and fourth, fifth parity as well as between the second parity and third, fourth, fifth and seventh parity were very significantly different (P < 0.01).