**Table S1.** Primers used for sequencing and genotyping, \*A single sequenceable product was not obtained with these primers.

|  |  |  |
| --- | --- | --- |
| **Name** | **Sequence** | **Amplicon size** |
| K9\_MLPH\_Ex1\_F | CAGAATTGGGTAGGAATCCA | 659 |
| K9\_MLPH\_Ex1\_R | GAAAGGGAGTGCCCTCTG |
| K9\_MLPH\_Ex2\_F | AGTTCCAAGTGTGCAGGAAC | 592 |
| K9\_MLPH\_Ex2\_R | CTGAAGCTGGATCAAGAGGA |
| K9\_MLPH\_Ex3-4\_F | GGAGACCCAGGATCGAGT | 728 |
| K9\_MLPH\_Ex3-4\_R | CACACTCACATTCCAAAGGA |
| K9\_MLPH\_Ex5\_F | GAAGTGATGGAGGTCACTGTT | 517 |
| K9\_MLPH\_Ex5\_R | TGCATGAGTGTGCTTGTGTA |
| K9\_MLPH\_Ex6\_F | GGGTCTAAATGATGCTTGGA | 556 |
| K9\_MLPH\_Ex6\_R | CCTCTTTCGTGCTCAGTCTC |
| K9\_MLPH\_Ex7\_F | CAGGTGTTTCCTTCTGCTCT | 580 |
| K9\_MLPH\_Ex7\_R | CATCCCGTACACCACTTCTC |
| UMN\_MLPH\_Ex7\_F | GCAGGTGTTTCCTTCTGCTC | 582 |
| UMN\_MLPH\_Ex7\_R | CCATCCCGTACACCACTTCT |
| K9\_MLPH\_Ex8\_F | GTCCCTCGTGTGATGAGTG | 685 |
| K9\_MLPH\_Ex8\_R | ATTAGCGCTGGAACTTCTGA |
| K9\_MLPH\_Ex9\_F | TAAAGTCACCTCTGCTCGTG | 617 |
| K9\_MLPH\_Ex9\_R | TTGAAGGCTCTGATTTCTCC |
| K9\_MLPH\_Ex10\_F | TCAGAGGGAAGAACTGTTGG | 528 |
| K9\_MLPH\_Ex10\_R | CTTCGTCACAACCTCTGGAC |
| *K9\_MLPH\_Ex11\_F* | *GTCCAGAGGTTGTGACGAAG* | \*629 |
| *K9\_MLPH\_Ex11\_R* | *GTCAGAGTCTGGTCCTGAGC* |
| K9\_MLPH\_Ex12\_F | CCTTAGAGCTACAGCGATGC | 569 |
| K9\_MLPH\_Ex12\_R | CCAAGTTCTCACAGGAAAGG |
| K9\_MLPH\_Ex13\_F | AGGCAAACAGAGGGTGGT | 506 |
| K9\_MLPH\_Ex13\_R | TTACCCAGAGCCAAAGACAC |
| K9\_MLPH\_Ex14\_F | CTGAAGGCAGATGCTCAAC | 424 |
| K9\_MLPH\_Ex14\_R | CTGCTTCCCTCTGGTGAC |
| K9\_MLPH\_Ex15\_F | GTTGGCTAGGATGTGAGAGC | 578 |
| K9\_MLPH\_Ex15\_R | CTTTAAATCTTTGGCCGATTT |
| K9\_MLPH\_Ex16\_F | GCTTCAGAGCCTGAAATTCT | 407 |
| K9\_MLPH\_Ex16\_R | GTACAGGAAAGCCACGTCA |
| d1\_PCR\_primer\_F | CCTTCCTCCCCTGTAGGAC | 268 |
| d1\_PCR\_primer\_R | GTAGCCCTGAGGCCTGTGT |

**Table S2.** D locus genotype data across breeds. Breeds are separated by double lines and families within breeds in which allele segregation can be followed are separated by a thick line.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Breed** | **Dog** | **Color** | **d1 Genotype** | **d2 Genotype** | **d3 Genotype** | **D locus Genotype** | **Relationship** |
| Pumi | P1 | greying | D/d1 | D/D | D/D | D/d1 | Dam of P2-P4 |
| Pumi | P2 | grey | D/d1 | D/D | D/d3 | d1/d3 | offspring |
| Pumi | P3 | black | D/D | D/D | D/D | D/D | offspring |
| Pumi | P4 | greying | D/D | D/D | D/D | D/D | offspring |
| Pumi | P5 | black | D/D | D/D | D/d3 | D/d3 | Dam of P7-P11 |
| Pumi | P6 | black | D/d1 | D/D | D/D | D/d1 | Sire of P7-P11 |
| Pumi | P7 | black | D/D | D/D | D/D | D/D | offspring |
| Pumi | P8 | black | D/D | D/D | D/D | D/D | offspring |
| Pumi | P9 | black | D/d1 | D/D | D/D | D/d1 | offspring |
| Pumi | P10 | grey | D/d1 | D/D | D/d3 | d1/d3 | offspring |
| Pumi | P11 | black | D/D | D/D | D/d3 | D/d3 | offspring |
| Pumi | P12 | black | D/d1 | D/D | D/D | D/d1 | Dam of P13,P14 |
| Pumi | P13 | black | D/D | D/D | D/D | D/D | offspring |
| Pumi | P14 | grey | D/d1 | D/D | D/d3 | d1/d3 | offspring |
| Mudi | Mudi02 | black | D/D | D/D | D/d3 | D/d3 | Sire of Mudi04-6,15,16 |
| Mudi | Mudi03 | black merle | D/D | D/D | D/d3 | D/d3 | Dam of Mudi04-6,15,16 |
| Mudi | Mudi04 | grey merle | D/D | D/D | d3/d3 | d3/d3 | offspring |
| Mudi | Mudi05 | cream merle | D/D | D/D | d3/d3 | d3/d3 | offspring |
| Mudi | Mudi06 | grey | D/D | D/D | d3/d3 | d3/d3 | offspring |
| Mudi | Mudi15 | cream merle | D/D | D/D | D/d3 | D/d3 | offspring |
| Mudi | Mudi16 | black | D/D | D/D | D/d3 | D/d3 | offspring |
| Mudi | Mudi07 | black merle | D/D | D/D | D/d3 | D/d3 | Dam of Mudi08 |
| Mudi | Mudi08 | black merle | D/D | D/D | D/D | D/D | offspring |
| Mudi | Mudi09 | black | D/D | D/D | D/D | D/D |  |
| Mudi | Mudi10 | black | D/d1 | D/D | D/D | D/d1 |  |
| Mudi | Mudi11 | black | D/d1 | D/D | D/D | D/d1 |  |
| Mudi | Mudi12 | black | D/D | D/D | D/D | D/D |  |
| Mudi | Mudi13 | black | D/d1 | D/D | D/D | D/d1 |  |
| Mudi | Mudi14 | black | D/D | D/D | D/D | D/D |  |
| Mudi | Mudi01 | black merle | D/D | D/D | D/D | D/D |  |
| Mudi | Mudi17 | black merle | D/D | D/D | D/d3 | D/d3 |  |
| Mudi | Mudi18 | black merle | D/D | D/D | D/d3 | D/d3 |  |
| Mudi | Mudi19 | grey-brown merle | D/d1 | D/D | D/d3 | d1/d3 | offspring |
| Mudi | Mudi20 | black merle | D/d1 | D/D | D/d3 | d1/d3 | Dam of Mudi019 |
| Wolfdog | AW1 | black | D/d1 | D/D | D/D | D/d1 | Dam of AW2,3 |
| Wolfdog | AW2 | grey | d1/d1 | D/D | D/D | d1/d1 | offspring |
| Wolfdog | AW3 | grey | D/d1 | D/D | D/d3 | d1/d3 | offspring |
| Wolfdog | WD01 | grey fawn | D/D | D/D | d3/d3 | d3/d3 | Sire of WD04 |
| Wolfdog | WD04 | grey | D/D | D/D | d3/d3 | d3/d3 | offspring |
| Wolfdog | WD02 | grey | D/D | D/D | d3/d3 | d3/d3 |  |
| Wolfdog | WD03 | husky domino | D/D | D/D | D/D | D/D |  |
| Shih Tzu | ShT3 | grey | d1/d1 | D/D | d3/d3 | ? | Dam of ShT5,6 |
| Shih Tzu | ShT4 | white | D/D | D/D | D/D | D/D | Sire of ShT5,6 |
| Shih Tzu | ShT5 | not dilute | D/d1 | D/D | D/d3 | d1/d3 | offspring |
| Shih Tzu | ShT6 | not dilute | D/d1 | D/D | D/d3 | d1/d3 | offspring |
| Chihuahua | Ch1 | grey | D/d1 | D/D | D/d3 | d1/d3 |  |
| Italian Greyhound | IG1 | grey | D/d1 | D/D | D/d3 | d1/d3 |  |
| Pekingese | Pk1 | brown | D/D | D/D | D/d3 | D/d3 |  |
| Pekingese | Pk2 | white | D/d1 | D/D | D/d3 | d1/d3 |  |