

1 **Supporting information**

2 Additional supporting information may be found online in the supporting
3 information tab for this article:

4 **Table S1** Number of pathways enriched by the DEGs and DAS Genes.

5 **Table S2** Table S2-1.xlsx: Pathways enriched in muscle, brain and skin tissues by DEGs
6 and DAS genes that identified between mule and horse.

7 **Table S3** Table S3-1.xlsx: Pathways in muscle, brain and skin tissues by DEGs and
8 DAS genes that identified between mule and donkey.

9 **Figure S1** The PCA of the brain, muscle, and skin tissues in horses, donkeys, mules
10 and hinnies.

11 **Figure S2** The venn diagrams of differentially expressed genes among three tissues.

12 **Figure S3** Top 10 pathways enriched in muscle tissue by DEGs.

13 **Figure S4** Top 10 pathways enriched in brain tissue by DEGs.

14 **Figure S5** Top 10 pathways enriched in skin tissue by DEGs.

15 **Figure S6** The venn diagrams of differentially expressed genes and differentially
16 spliced genes in brain, muscle, and skin tissues.

17 **Figure S7** Proportion of five splicing types of the DAS genes in three tissues.

18 **Figure S8** Top 10 pathways enriched in muscle tissue by DAS genes.

19 **Figure S9** Top 10 pathways enriched in brain tissue by DAS genes.

20 **Figure S10** Top 10 pathways enriched in skin tissue by DAS genes.

21 **Figure S11** Validation of DAS genes identified in the muscle tissues between mule and
22 horse by the full-length transcriptome data generated from Pac-Bio sequencing
23 platform.

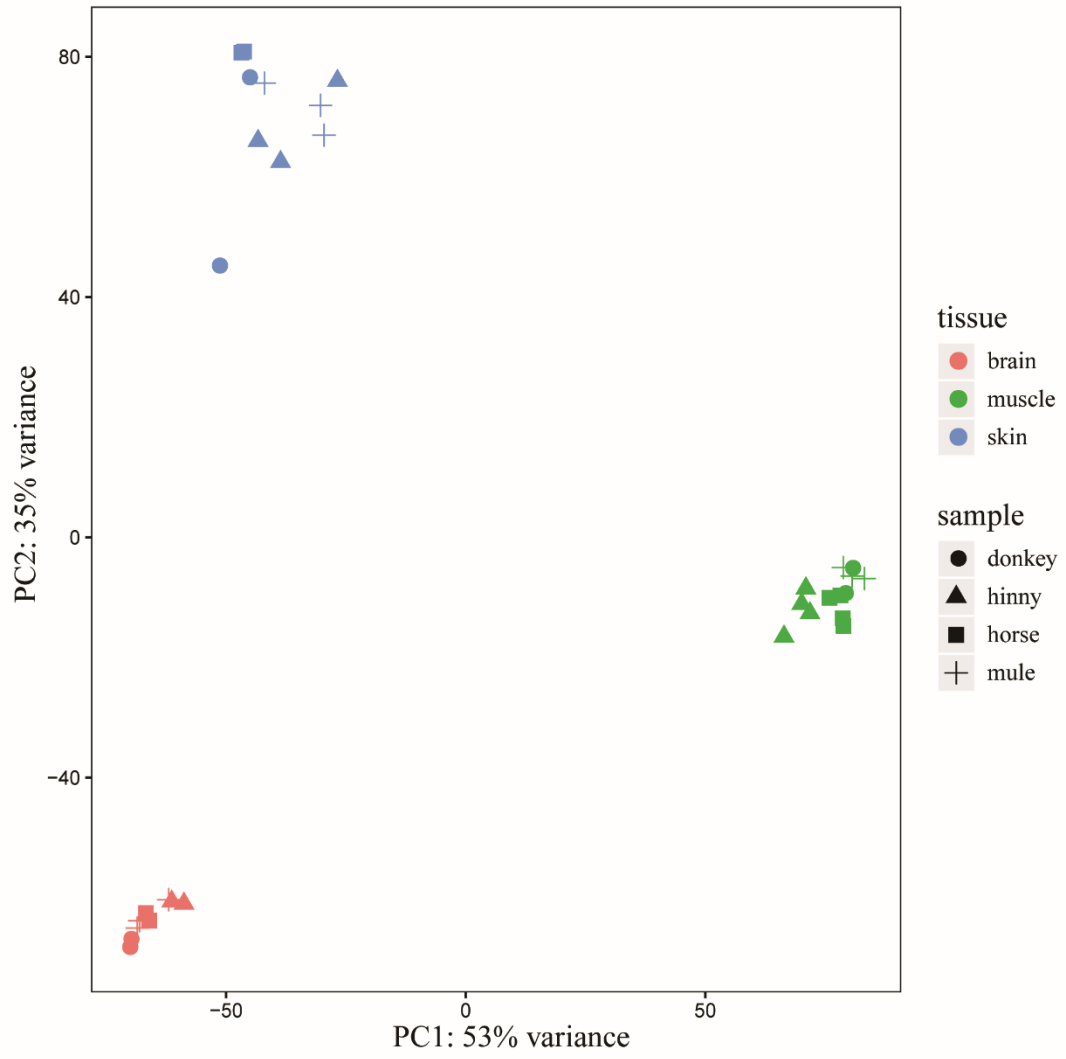
24 **Figure S12** The result of transcriptome data mapping on the *TNNC2* gene among the
25 muscle tissues of hinny, mule, donkey and horse.

26 **Figure S13** The result of transcriptome data mapping on the *RYR1* gene among the
27 muscle tissues of hinny, mule, donkey and horse.

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Table S1 Number of pathways enriched by the DEGs and DAS Genes.

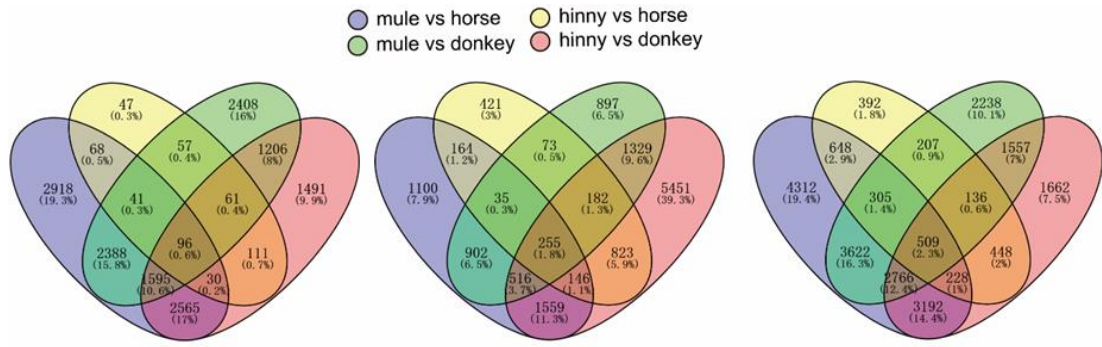
| Type | Tissues | Mules vs horses | Mules vs donkeys | Hinnies vs horses | Hinnies vs horses |
|-----------|---------|-----------------|------------------|-------------------|-------------------|
| DEGs | Muscle | 1,030 | 84 | 778 | 979 |
| | Brain | 900 | 294 | 665 | 974 |
| | Skin | 1,045 | 458 | 798 | 850 |
| DAS genes | Muscle | 564 | 79 | 503 | 621 |
| | Brain | 377 | 108 | 358 | 484 |
| | Skin | 289 | 85 | 381 | 341 |



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Figure S1 The PCA of the brain, muscle, and skin tissues in horses, donkeys, mules and hinnies.

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muscle

brain

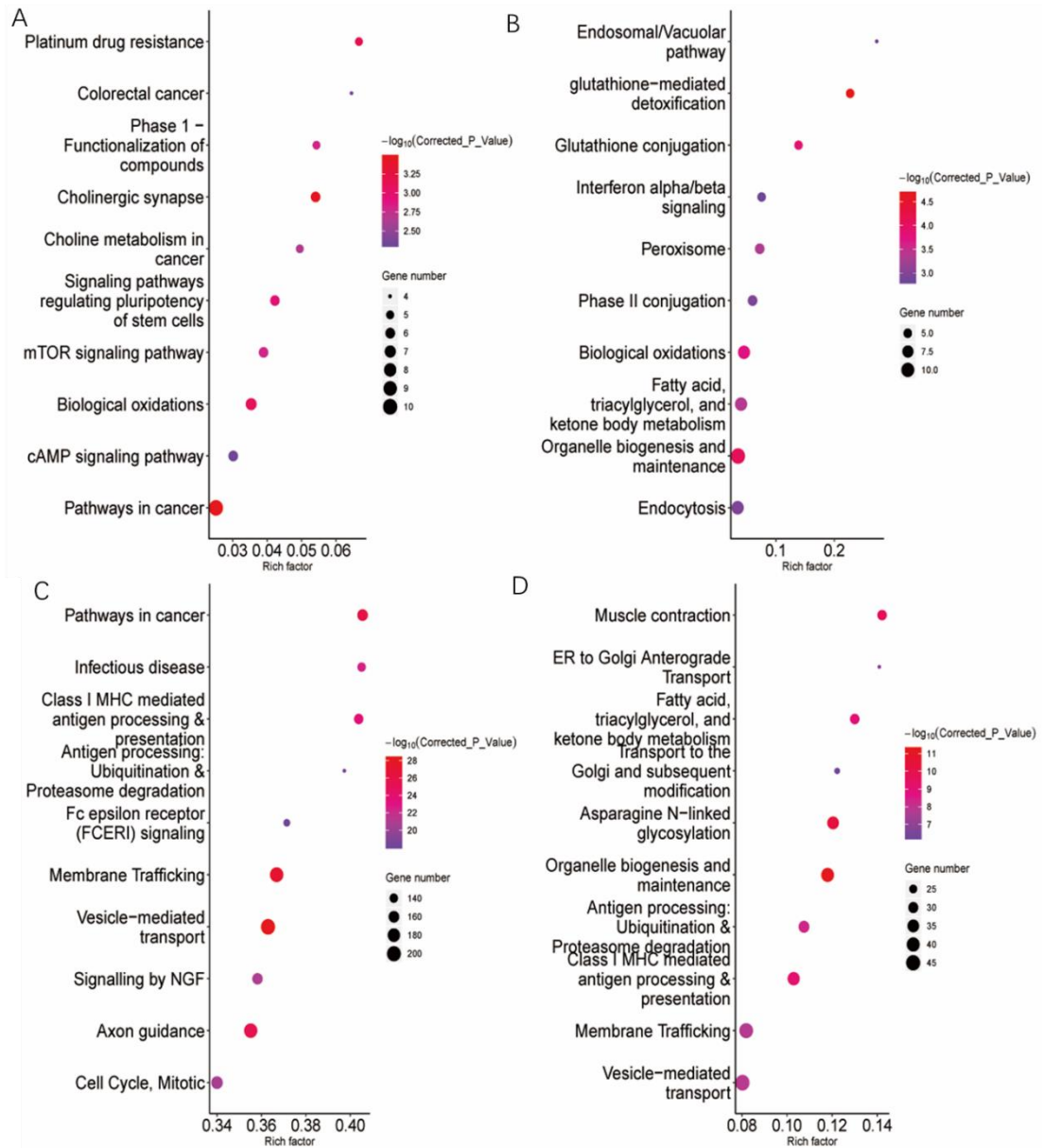
skin

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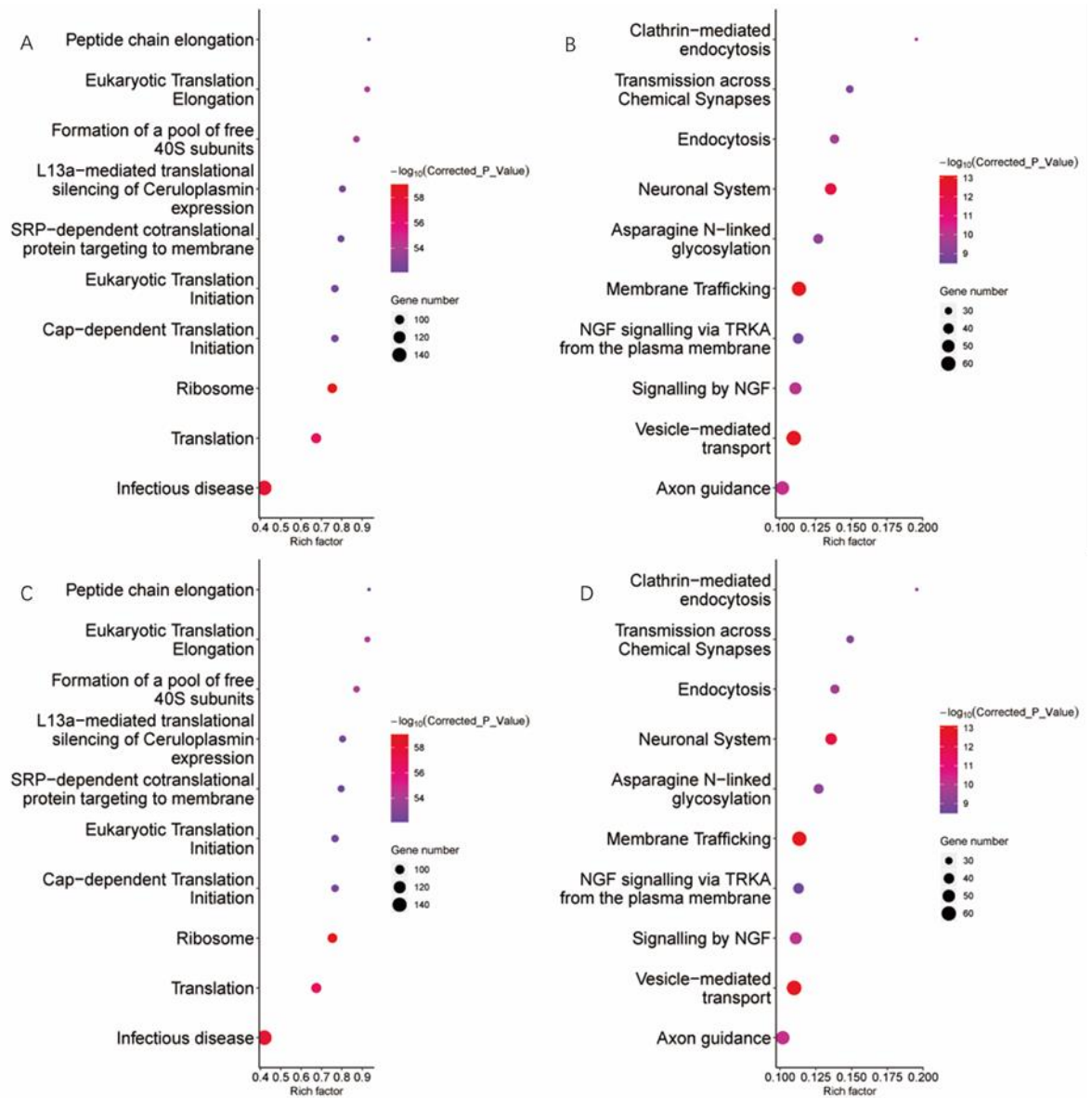
Figure S2 The venn diagrams of differentially expressed genes among three tissues.

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 39 **Figure S3 Top 10 pathways enriched in muscle tissue by DEGs. A,** pathways enriched by
 40 the DEGs between mule vs donkey. **B,** pathways enriched by the DEGs between mule vs horse. **C,**
 41 pathways enriched by the DEGs between hinny vs donkey. **D,** pathways enriched by the DEGs
 42 between hinny vs horse.

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Figure S4 Top 10 pathways enriched in brain tissue by DEGs. A, pathways enriched by

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the DEGs between mule vs donkey. **B,** pathways enriched by the DEGs between mule vs horse. **C,**

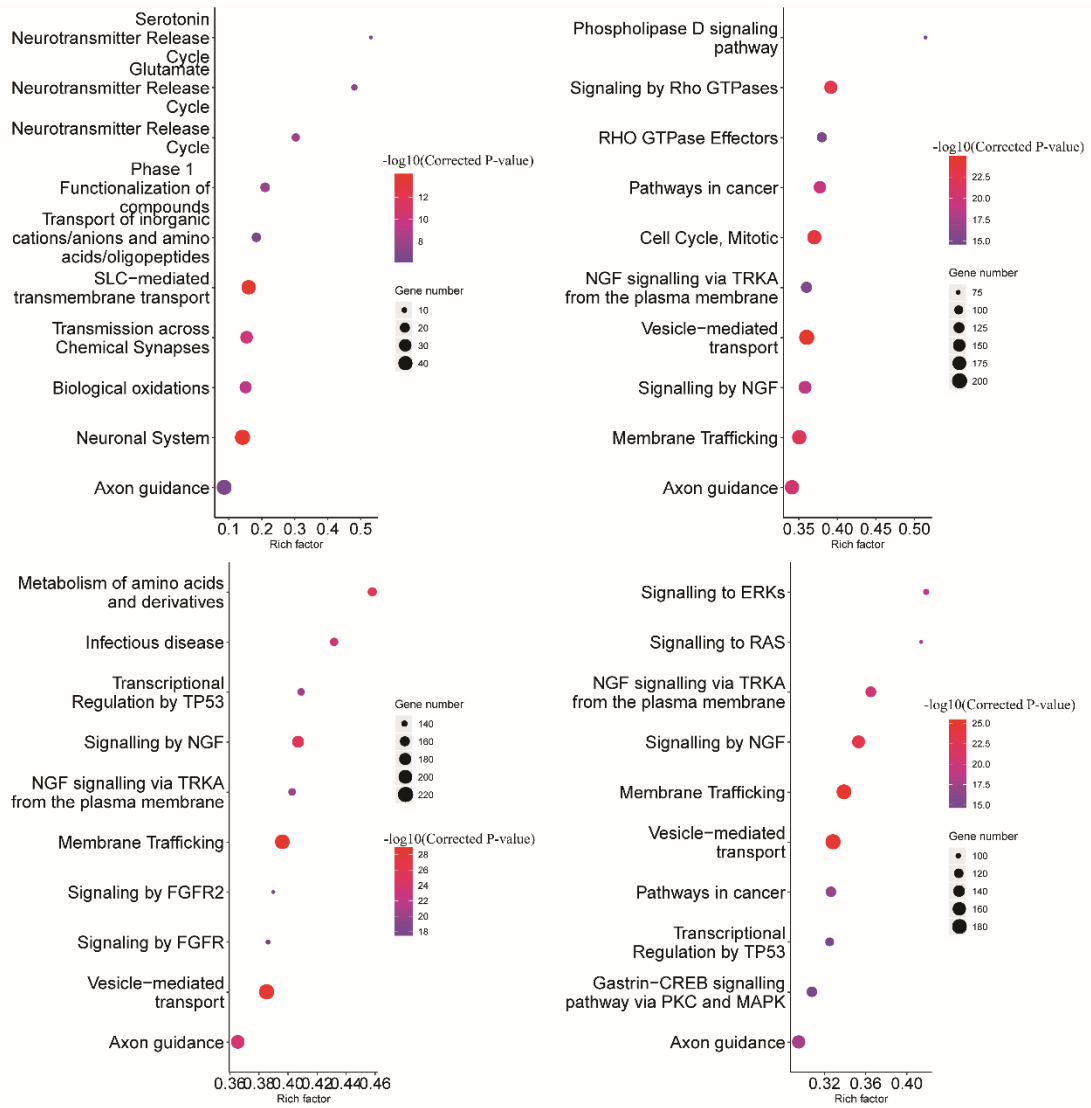
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pathways enriched by the DEGs between hinny vs donkey. **D,** pathways enriched by the DEGs

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between hinny vs horse.

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Figure S5 Top 10 pathways enriched in skin tissue by DEGs. A, pathways enriched by the

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DEGs between mule vs donkey. **B,** pathways enriched by the DEGs between mule vs horse. **C,**

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pathways enriched by the DEGs between hinny vs donkey. **D,** pathways enriched by the DEGs

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between hinny vs horse.

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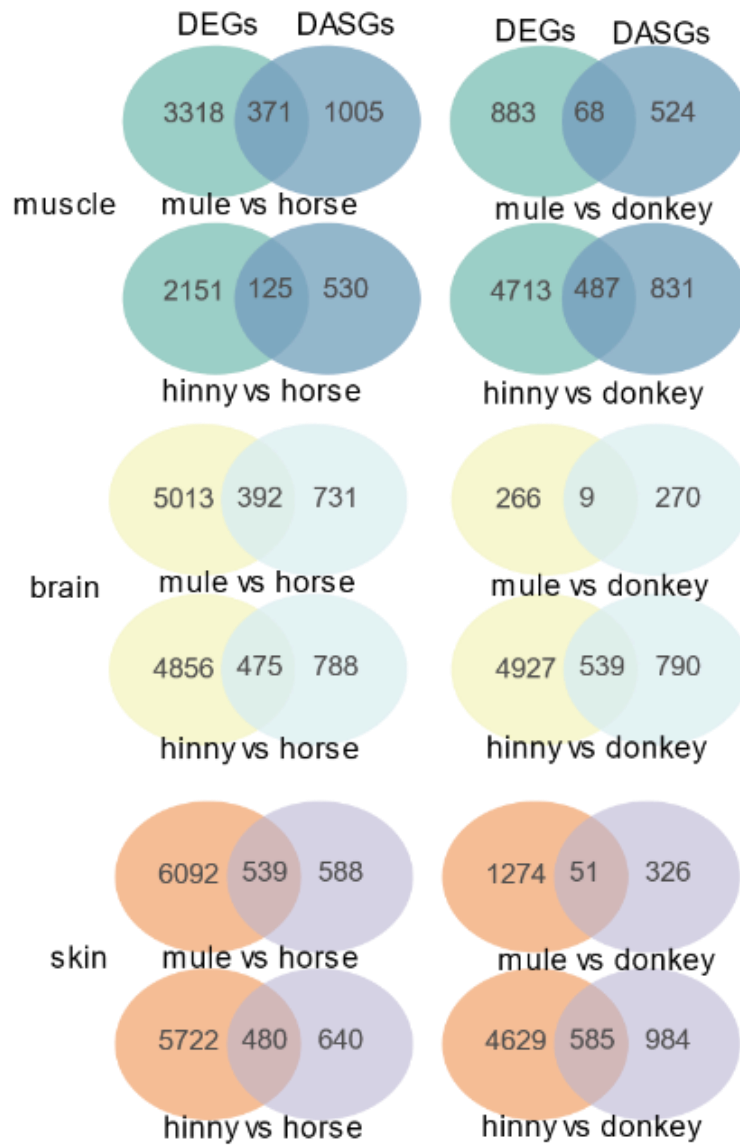
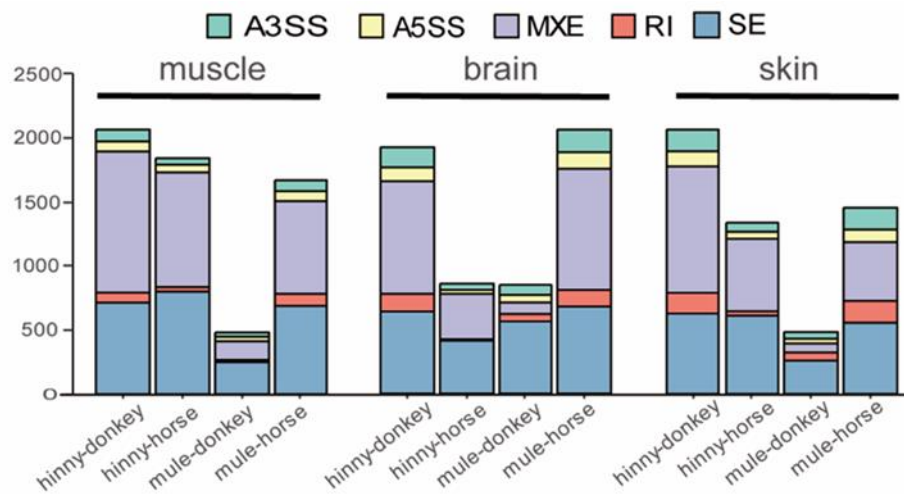


Figure S6 The venn of differentially expressed genes and differentially spliced genes in brain, muscle, and skin tissues.



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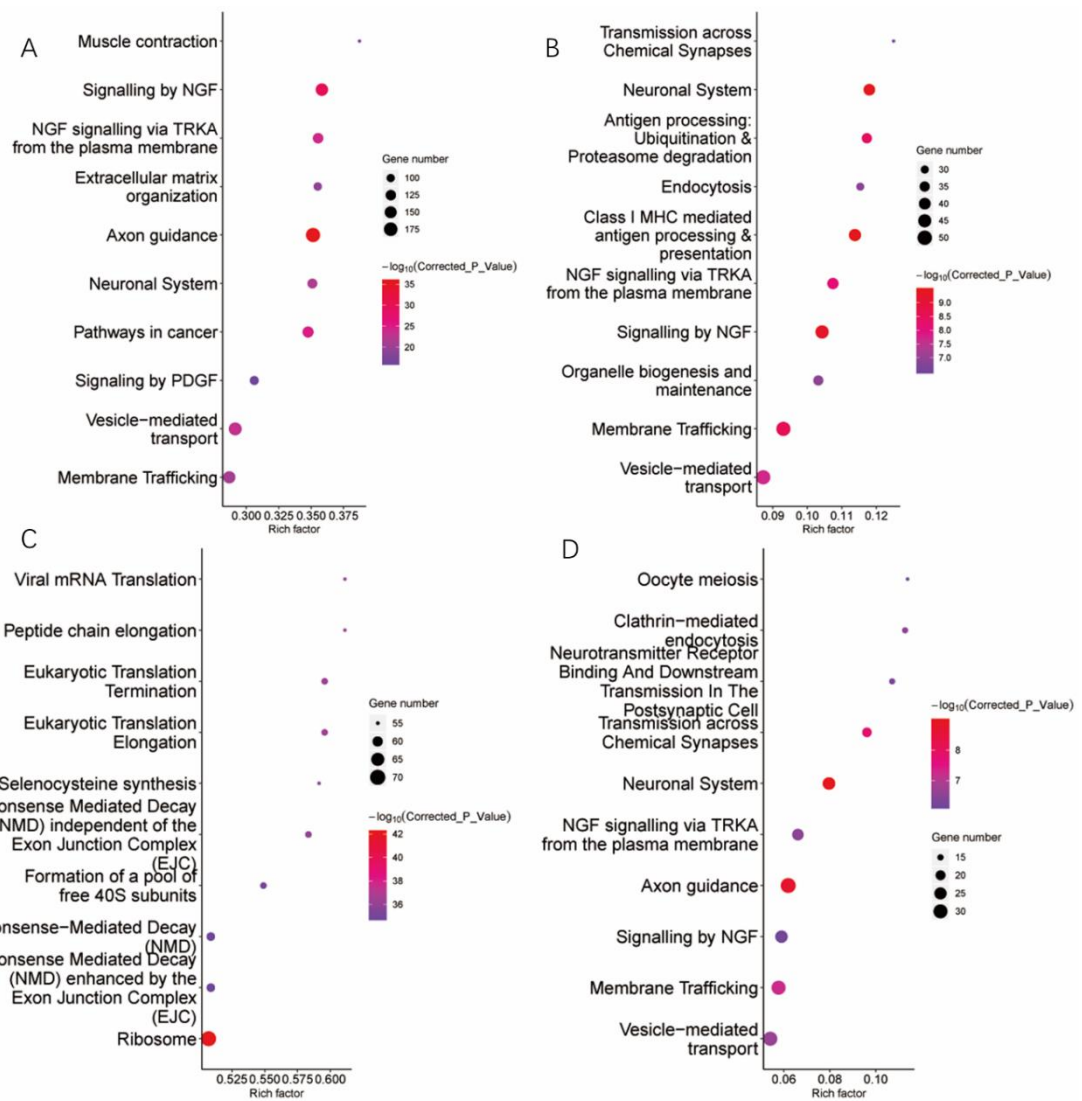
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Figure S7 Proportion of five splicing types of the DAS genes in three tissues. A3SS,
 Alternative acceptor site **A5SS**, Alternative donor site **MXE**, Mutually exclusive exons **RI**, Intron
 retention **SE**, Exon skipping.



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Figure S8 Top 10 pathways enriched in muscle tissue by DAS genes. A, pathways

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enriched by the DAS genes between mule vs donkey. **B,** pathways enriched by the DAS genes

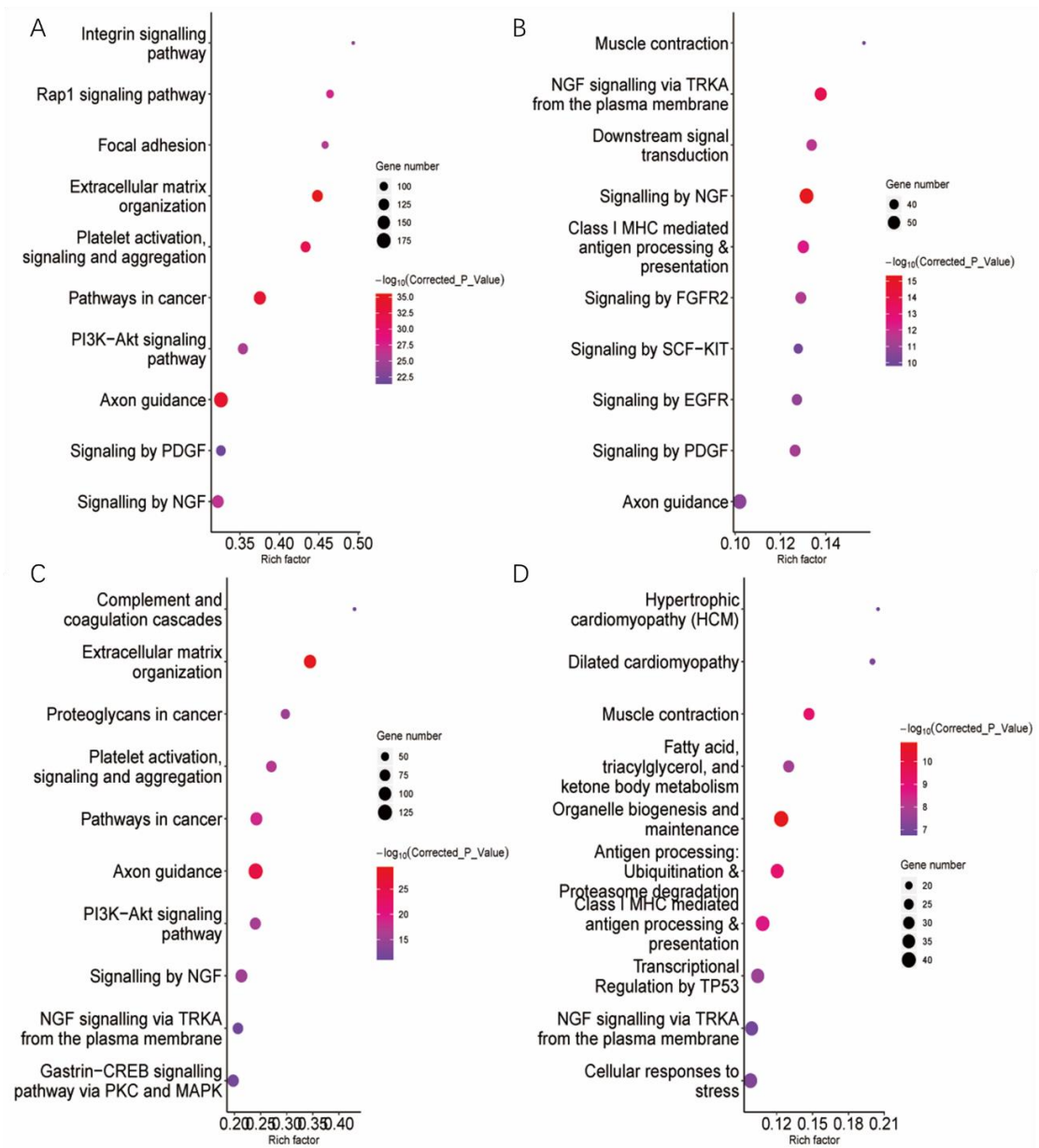
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between mule vs horse. **C,** pathways enriched by the DAS genes between hinny vs donkey. **D,**

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pathways enriched by the DAS genes between hinny vs horse.

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Figure S9 Top 10 pathways enriched in brain tissue by DAS genes. A, pathways enriched

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by the DAS genes between mule vs donkey. **B,** pathways enriched by the DAS genes between

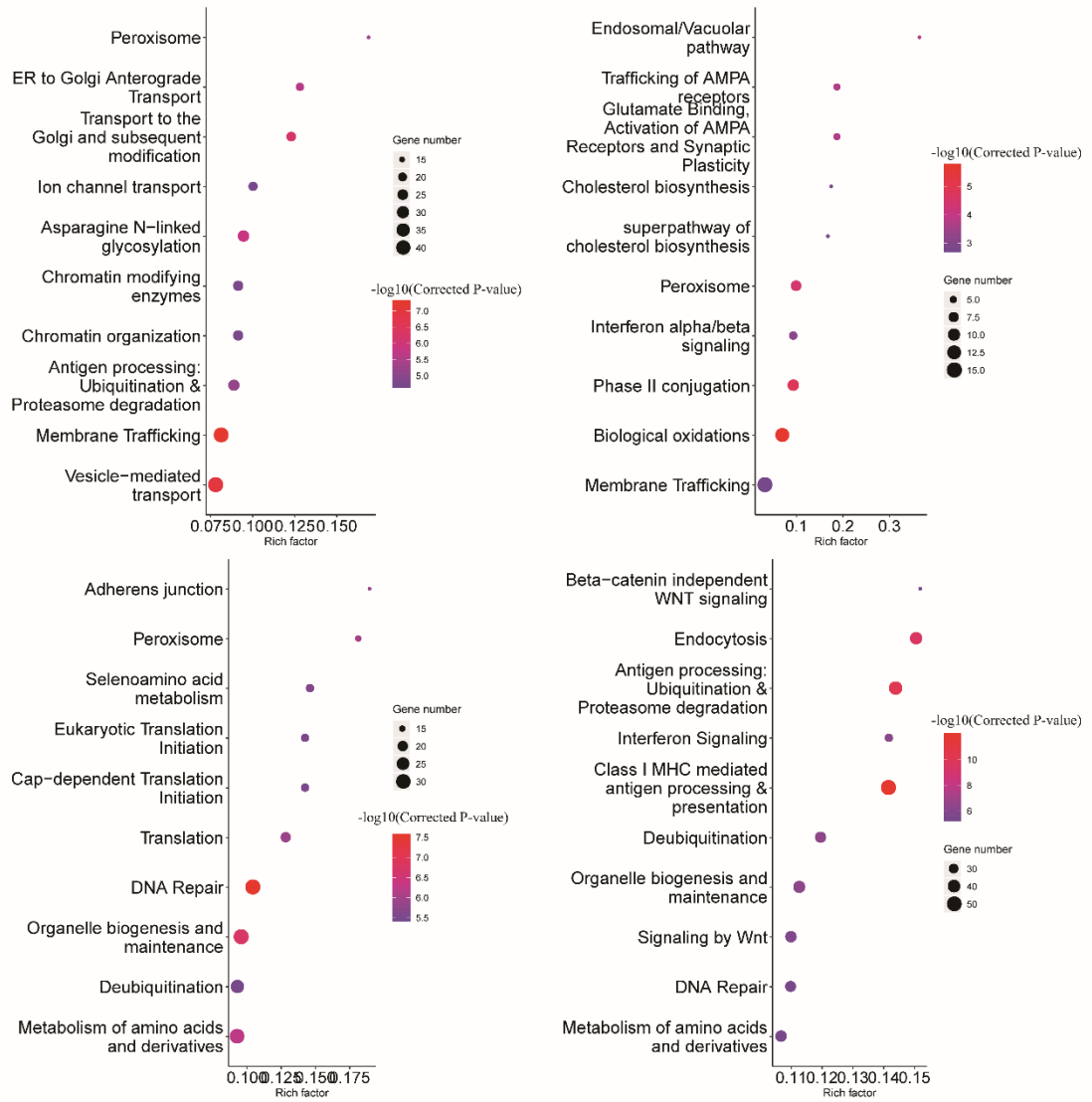
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mule vs horse. **C,** pathways enriched by the DAS genes between hinny vs donkey. **D,** pathways

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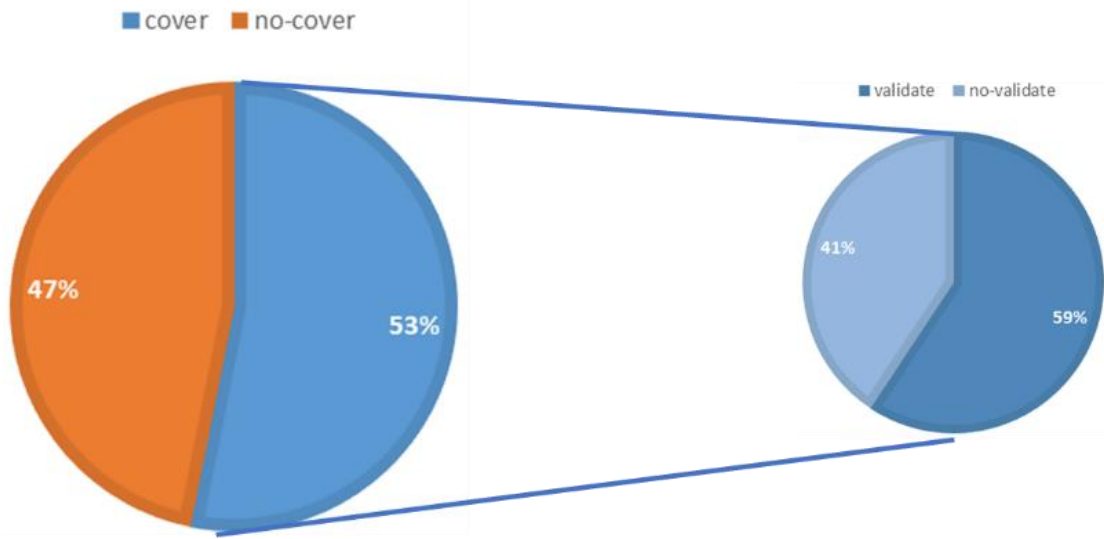
enriched by the DAS genes between hinny vs horse.

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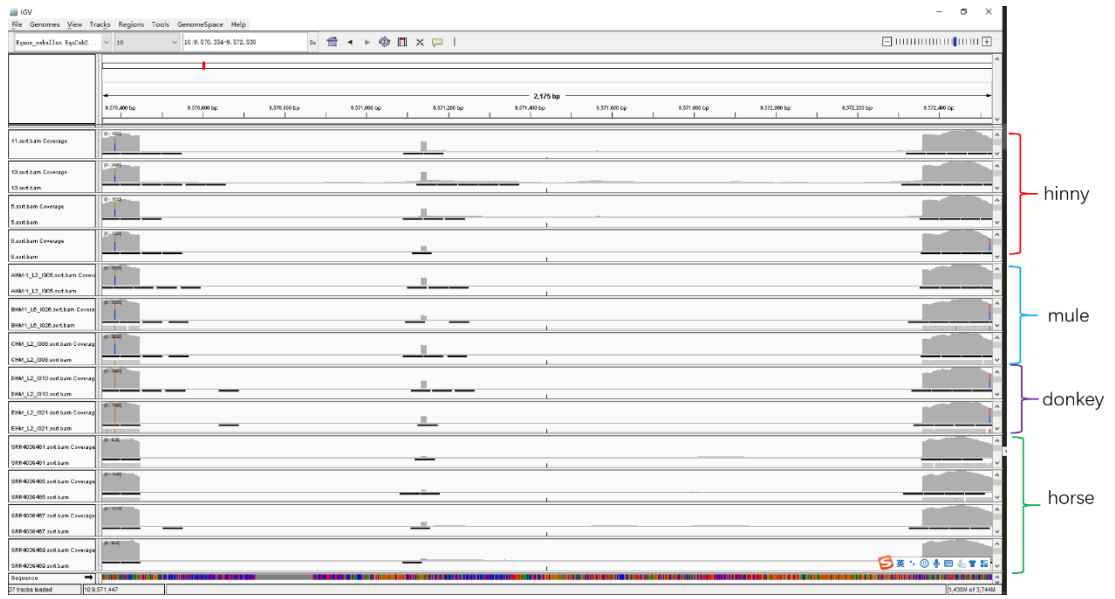
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Figure S10 Top 10 pathways enriched in skin tissue by DAS genes. A, pathways enriched by the DAS genes between mule vs donkey. **B,** pathways enriched by the DAS genes between mule vs horse. **C,** pathways enriched by the DAS genes between hinny vs donkey. **D,** pathways enriched by the DAS genes between hinny vs horse.



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Figure S11 Validation of DAS genes identified in the muscle tissues between mule and horse by the full-length transcriptome data generated from Pac-Bio sequencing platform.



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Figure S12 The result of transcriptome data mapping on the *TNNC2* gene among the muscle tissues of hinny, mule, donkey and horse.



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Figure S13 The result of transcriptome data mapping on the *RYR1* gene among the muscle tissues of hinny, mule, donkey and horse.