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Molecular Cloning, Sequence Identification and Tissue Expression Profile of Three Novel Sheep (*Ovis aries*) Genes-*ZFAND5*, *ZGPAT* and *ZDHHC7*

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Abstract: The complete coding sequences of three sheep genes ZFAND5, ZGPAT and ZDHHC7 were amplified using the Reverse Transcriptase Polymerase Chain Reaction (RT-PCR). The sheep ZFAND5 gene encodes a protein of 213 amino acids that shares high homology with the Zinc finger, AN1-type Domain 5 (ZFAND5) proteins of eight species; cattle (100%), pig (99%), human (99%), rabbit (99%), mouse (98%), giant panda (98%), gray short-tailed opossum (97%) and Northern white-cheeked gibbon (97%). The sheep ZGPAT gene encodes a protein of 513 amino acids that shares high homology with the Zinc finger CCCH-type with G patch domain-containing protein (ZGPAT) proteins of seven species; cattle (97%), giant panda (84%), rabbit (99%), human (79%), rat (76%), mouse (77%) and chimpanzee (78%). The sheep ZDHHC7 gene encodes a protein of 308 amino acids that shares high homology with the Zinc finger, DHHC-type containing 7 (ZDHHC7) proteins of nine species; cattle (99%), dog (93%), pig (93%), human (93%), giant panda (93%), Northern white-cheeked gibbon (92%), mouse (92%), white-tufted-ear marmoset (92%) and rat (92%). Finally, these three novel sheep genes were assigned to GeneIDs; 100302558, 100302028 and 100302557. The phylogenetic analysis revealed that the sheep ZFAND5, ZGPAT and ZDHHC7 genes all have a closer genetic relationship with the ZFAND5, ZGPAT and ZDHHC7 genes of cattle. Tissue expression profile analysis was also carried out and results demonstrated that sheep ZFAND5, ZGPAT and ZDHHC7 genes were all generally but differentially expressed in detected tissues.

Key words: Sheep, ZFAND5, ZGPAT, ZDHHC7, tissue expression, China

INTRODUCTION

Zinc finger, AN1-type Domain 5 (ZFAND5) contains an A20-like Zinc finger domain (ZnF-A20) at its N terminus and an AN1-like domain (ZnF-AN1) at its C terminus. Similar to A20, ZFAND5 interacted with IKKgamma, RIP and TRAF6 in co-immunoprecipitation experiments (Huang et al., 2004). Latest research demonstrated that ZFAND5 is a potent inhibitory factor for osteoclast differentiation and that the mechanism is unlikely due to direct attenuation of the NF-kappa B pathway (Hishiya et al., 2005, 2006). Zinc finger CCCHtype with G patch domain-containing protein (ZGPAT), a Zinc finger and G-patch domain-containing protein, acts as a transcription repressor through the recruitment of the nucleosome remodelling and deacetylase complex. Transcriptional target analysis revealed that ZGPAT regulates several cellular signalling pathways including EGFR pathways that are critically involved in cell

proliferation, survival and migration. This gene inhibits cell proliferation and suppresses breast carcinogenesis and that ZGPAT depletion leads to a drastic tumour growth *in vivo*. ZGPAT is downregulated in breast carcinomas and that its level of expression is negatively correlated with that of EGFR. These indicate that ZGPAT is a novel transcription repressor and a potential tumour suppressor (Li *et al.*, 2009).

Zinc finger, DHHC-type containing 7 (ZDHHC7) also, a Zinc finger domain-containing protein, appears to have a role in maintaining sertoli cell differentiated functions and mediating FSH actions (Chaudhary and Skinner, 2002).

As mentioned, ZFAND5, ZGPAT and ZDHHC7 genes are three genes which have important functions. Until today, ZFAND5, ZGPAT and ZDHHC7 genes had been reported in human and other animals but the sheep ZFAND5, ZGPAT and ZDHHC7 genes have not been reported yet.

In present experiment, researchers will isolate the coding sequences of sheep ZFAND5, ZGPAT and ZDHHC7 genes based on the coding sequence information of ZFAND5, ZGPAT and ZDHHC7 genes from human or other mammals and their highly homologous sheep ESTs sequence information, subsequently perform sequence and tissue expression profile analysis for these genes. These will establish the primary foundation of understanding these three sheep genes.

MATERIALS AND METHODS

Animals and sample preparation: Five adult Yunnan local sheep were slaughtered. Spleen, skin, lung, fat, muscle, heart, liver, kidney and ovary samples were collected, frozen in liquid nitrogen and then stored at -80°C. The total RNA was extracted using the total RNA extraction kit (Gibco, USA). First-strand cDNA synthesis was performed as that described by Liu *et al.* (2004). These 1st-strand cDNA samples were used to perform RT-PCR for the isolation of sheep *ZFAND5*, *ZGPAT* and *ZDHHC7* genes and for the tissue expression profile analysis.

Isolation of the sheep ZFAND5, ZGPAT and ZDHHC7 genes: The primers for sheep ZFAND5 gene isolation were designed based on the coding sequence information of human ZFAND5 gene and its highly homologous sheep EST sequences; EE756605 and EE814109. Similarly, the primers for sheep ZGPAT gene isolation were designed based on the coding sequence information from human ZGPAT gene and its highly homologous sheep EST sequences; EE809332 and EE802245. The primers for sheep ZDHHC7 gene isolation were designed based on the coding sequence information from human and mouse ZDHHC7 genes and their highly homologous sheep EST sequences; EE832186 and EE809375. These primer sequences and their annealing temperature for RT-PCR reaction were shown in Table 1. The RT-PCR was performed to isolate these three sheep genes using the pooled cDNAs from different tissues above. The 25 µL reaction system was; 2.0 µL cDNA, 2.5 µL 2 mM mixed dNTPs, 2.5 μL 10×Taq DNA polymerase buffer, 2.5 µL 25 mM MgCl₂, 2.0 µL 10 µM forward primer, 2.0 µL 10 µM reverse primer, 2.0 units of Taq DNA polymerase (1 U 1 μ L⁻¹) and 9.5 μ L sterile water. The PCR program initially started with a 94°C denaturation for 4 min followed by 35 cycles of 94°C/50 sec, Ta°C/50 sec, 72°C/50 sec then 72°C extension for 10 min, finally 4°C to terminate the reaction. These PCR products for sheep ZFAND5, ZGPAT and ZDHHC7 genes were then cloned into PMD18-T vector and sequenced bidirectionally with the commercial fluorometric method. At least five independent clones were sequenced for every gene.

Table 1: Primers for sheep ZFAND5, ZGPAT, ZDHHC7 and beta-actin genes and their annealing temperatures

Genes	Primer sequences	Ta/°C
ZFAND5	Forward:5'-ATGGCTCAGGAGACTAAC-3'	
	Reverse:5'-TTATATTCTCTGAATTTTTTCA-3'	55
ZGPAT	Forward:5'-ATGGACGAGGAGAGCCTG-3'	
	Reverse:5'-CTAGAACTCAGTCATCTTCTT-3'	61
ZDHHC7	Forward:5'-ATGCCGTCCTCAGGACAC -3'	
	Reverse:5'-TCACACTGAGAACTCCGGG-3'	61
Beta-actin	Forward:5'-CTTGATGTCACGGACGATTT-3'	
	Reverse:5'-CACGGCATTGTCACCAACT-3'	56

RT-PCR for tissue expression profile analysis: RT-PCR for tissue expression profile analysis was performed as previously described elsewhere (Liu and Gao, 2009; Yonggang and Shizheng, 2009; Liu, 2009). The researchers selected the housekeeping gene beta-actin (Accession No.: NM 001009784) as a positive control. The primers of sheep ZFAND5, ZGPAT and ZDHHC7 genes which were used to perform the RT-PCR for tissue expression profile analysis were same as the primers for isolation RT-PCR. The PCR reactions were optimized for a number of cycles to ensure product intensity within the linear phase of amplification. The 25 μL reaction system was; 1 μL cDNA (100 ng μL⁻¹), 5 pmoles each oligonucleotide primer, $2.5 \,\mu L$ 2 mmol L^{-1} mixed dNTPs, $2.5 \,\mu L$ $10 \times Taq$ DNA polymerase buffer, 2.5 µL 25 mmol L⁻¹ MgCl₂, 1.0 unit of Tag DNA polymerase and finally add sterile water to volume 25 µL. The PCR program initially started with a 94°C denaturation for 4 min followed by 25 cycles of 94°C/50 sec, Ta°C /50 sec, 72°C/50 sec then 72°C extension for 10 min, finally 4°C to terminate the reaction.

Sequence analysis: The cDNA sequence prediction was conducted using GenScan software (http://genes.mit.edu/GENSCAN.html). The protein prediction and analysis were performed using BLAST tool at the National Center for Biotechnology Information (NCBI) server (http://www.ncbi.nlm.nih.gov/BLAST) and the ClustalW software (http://www.ebi.ac.uk/clustalw).

RESULTS AND DISCUSSION

RT-PCR results for sheep ZFAND5, ZGPAT and ZDHHC7 genes: Through RT-PCR with pooled tissue cDNAs for sheep ZFAND5, ZGPAT and ZDHHC7 genes, the resulting PCR products were 642, 1542 and 927 bp (Fig. 1).

Sequence analysis: These cDNA nucleotide sequence analysis using the BLAST software at NCBI server (http://www.ncbi.nlm.nih.gov/BLAST) revealed that these three genes were not homologous to any of the known sheep genes and they were then deposited into the GenBank database (Accession No.: FJ937959, FJ943995

and FJ937952). The sequence prediction was carried out using the GenScan software and results showed that the 642, 1542 and 927 bp cDNA sequences represent three single genes which encoded 213, 513 and 308 amino acids,

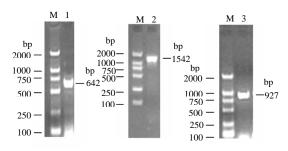


Fig.1: RT-PCR results for sheep ZFAND5, ZGPAT and ZDHHC7 genes. M, DL2000 DNA markers; 1, PCR product for sheep ZFAND5 gene; 2, PCR product for sheep ZGPAT gene; 3, PCR product for sheep ZDHHC7 gene

respectively. Finally, these three novel sheep genes were assigned to GeneIDs: 100302558, 100302028 and 100302557.

Further BLAST analysis of these proteins revealed that the sheep ZFAND5 protein has high homology with the Zinc finger, AN1-type domain 5 (ZFAND5) proteins of eight species; cattle (Accession No.: NP_001094515; 100%), pig (Accession No.: NP_001090975; 99%), human (Accession No.: NP_005998; 99%), rabbit (Accession No.: XP_002708253; 99%), mouse (Accession No.: NP_033577; 98%), Giant panda (Accession No.: XP_002914790; 98%), gray short-tailed opossum (Accession No.: XP_001365007; 97%) and Northern white-cheeked gibbon (Accession No.: XP_003267457; 97%) (Fig. 2).

The sheep ZGPAT protein has high homology with the Zinc finger CCCH-type with G patch domaincontaining protein (ZGPAT) proteins of seven species;



Fig. 2: The alignment of the protein encoded by sheep ZFAND5 gene and ten other kinds ZFAND5 proteins. Gray represents gray short-tailed opossum; Giant represents Giant panda; Northern represents Northern white-cheeked gibbon

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Sheep Cattle Giant Human Chimpanzee Mouse Rat	MDEESLQTALRTYDAQLQQVELALGAGLDPSELADLRQLQGDLKELIELTEASLVSIRKS MDEESLQTALRTYDAQLQQVELALGAGLDPSELADLRQLQGDLKELIELTEASLVSVRKS MDEESLQSALQTYGAQLQQVELALGAGLDPSELADLRQLQGDLKELIELTEASLVSVRKS MDEESLESALQTYRAQLQQVELALGAGLDSSEQADLRQLQGDLKELIELTEASLVSVRKS MDEESLESALQTYRAQLQQVELALGAGLDSSEQADLRQLQGDLKELIELTEASLVSVRKS MDEDNLETALQTYRAQLQQVELALGAGLDASEQADLRQLQGDLKELIELTEASLLSVRKS MDEDNLETALQTYRAQLQQVELALGAGLDASEQADLRQLQGDLKELIELTEASLLSVRKS MDEDNLETALQTYRAQLQQVELALGAGLDASEQADLRQLQGDLKELIELTEASLLSVRKS MDEDNLETALQTYRAQLQQVELALGAGLDASEQADLRQLQGDLKELIELTEASLLSVRKS ***:*********************************
Sheep Cattle Giant Human Chimpanzee Mouse Rat	KLLAALDGERP-VQEDAEPLAFQNAIVETAEVPVAP-GAELETVPSRETGFGFTEFGQEE KLLAALDGERP-AQEDAEPLALQNAIAETAEVPVAP-GAELETVPSRETGFGFTERGQEE KLLAALDGEHP-APDDAEYLAFQKAVAEGVEVPVAP-GAELETVPSRETGFGFTERGQEE RLLAALDEERPGRQEDAEYQAFREAITEAVEAPBAARGSGSETVPKAEAGPESAAGGGEE RLLAALDEERPGRQEDAEYEDFREAITEAVEAPBAARGSGSETVPKAEAGPESAAGGQEE KLLSTVDQESP-AQEDAEYLAFGKAIAFEVEAPGAP-CNDSETAPGSEVQPGSTSSALEE KLLSTVDQESP-AQEDAEYLAFGKAIAFEVEAPGAP-GNDSETAPGSEVQPGSTSSALEE KLLSTVDQEHQEDAEYLAFGKAIAEEWPDP-GNDSKTVPGSEVQPTPTSSALEE :**::**
Human	DDGEDE-EGGAALSGRKVNAPYYSAWGTLEYHNAMVVGTEEADDGSPGVRVLYLYPTHKS DDGEDE-EGGAALSGRKVNAPYYSAWGTLEYHNAMIVGTEEADDGSPGVRVLYLYPTHKS EEDDEDEDEEEWSGRKVNAPYYSSWGTLEYHNAMIVGTEEAEDGSTGVRVLYLCPTHKS EEGDEEELSGTKVSAPYYSSWGTLEYHNAMVVGTEEAEDGSAGVRVLYLYPTHKS EEGDEEELSGTKVSAPYYSSWGTLEYHNAMVVGTEEAEDGSAGVRVLYLYPTHKS EEEDPDLEELSGAKVNAPYYSAWGTLEYHNAMVVGAEEAEDGSAGVRVLYLYPTHKS EEEDPDLEELSGAKVNAPYYSAWGTLEYHNAMVVGAEEAEDGSACVRVLYLYPTHKS ::::
Sheep Cattle Giant Human Chimpanzee Mouse Rat	LKPCPFFLEGKCRFQENCRFSHGQVVSVDELRPFQDPDLSSLQAGSACLAKRQDGLWYPA LKPCSFFLEGKCRFQENCRFSHGQVVSVDELRPFQDPDLSSLQAGSACLAKRQDGLWYPA LKPCPFFLEGKCRFQENCRFSHGQVVSVDELRPFQDPDLSSLQAGSACLAKRQDGLWYPA LKPCPFFLEGKCRFKENCRFSHGQVVSLDELRPFQDPDLSSLQAGSACLAKHQDGLWHAA LKPCPFFLEGKCRFKENCRFSHGQVVSLDELRPFQDPDLSSLQAGSACLAKHQDGLWHAA LKPCPFFLEGKCRFKENCRFSHGQVVSVDELRPFQDPDLSLLQTGSACLAKHQDGLWHPA LKPCPFFLEGKCRFKENCRFSHGQVVSVDELRPFQDPDLSLLQTGSACLAKHQDGLWHPA LKPCPFFLEGKCRFKENCRFSHGQLVSVDELRPFQDPDLSLLQTGSACLAKHQDGLWHPA LKPCPFFLEGKCRFKENCRFSHGQLVSVDELRPFQDPDLSLLQTGSACLAKHQDGLWHPA
Sheep Cattle Giant Human Chimpanzee Mouse Rat	RITDVDSGYYTVKFDSLLLKEAVVEGDSILPPLRTDPAGSSDSDGSDADDPSYARVVEPG RITDVDSGYYTVKFDSLLLKETVVEGDSILPPLRTEPAGSSDSDGSDADDPSYARVVEPG RITDVDNGYYTVKFDSLLLKEAVVEGDSILPPLRTEPAGSSDSDGGDADDPSYARVVEPS RITDVDNGYYTVKFDSLLLREAVVEGDGILPPLRTEATES-DSDBGTGDSSYARVVGSD RITDVDNGYYTVKFDSLLLREAVVEGDGILPPLRTEATES-DSDBGTGDSSYARVVGSD RITDVDNGYYTVKFDSLLLKEAVVEGDSILPPLRTEATESSDSDTGDASDSYARVVEPS RITDVDNGYYTVKFDSLLLKEAVVEGDSILPPLRTEATESSDSDTGDASDSSYARVVEPS RITDVDNGYYTVKFDSLLLKEAVVEGDSILPPLRTEATDSSDSDTGDASDSSYARVVEPS RITDVDNGYYTVKFDSLLLKEAVVEGDSILPPLRTEATDSSDSDTGDASDSYARVVEAN
Sheep Cattle Giant Human Chimpanzee Mouse Rat	AANPGTCSSAFAGWEVHTRGIGSRLLAKMGYEFGKGLGRRADGRVEFVHAVVLPRGKSLD AANPGTCSSAFAGWEVHTRGIGSRLLAKMGYEFGKGLGRHAEGRVEFVHAVVLPRGKSLD AADHGTCSSAFAGWEVHTRGIGSRLLAKMGYEFGKGLGRRAEGRVEFIHAVVLPRGKSLD AVDSGTCSSAFAGWEVHTRGIGSRLLIKMGYEFGKGLGRHAEGRVEFIHAVVLPRGKSLD AVDSGTCSSAFAGWEVHTRGIGSRLLIKMGYEFGKGLGRHAEGRVEFIHAVVLPRGKSLD TVDTGTCSSAFAGWEVHTRGIGSRLLIKMGYEFGKGLGRHAEGRVEFIHAVVLPRGKSLD TVDTGTCSSAFAGWEVHTRGIGSKLLVKMGYEFGKGLGRHAEGRVEFIHAVVLPRGKSLD TVDTGTCSSAFAGWEVHTRGIGSKLLVKMGYEFGKGLGRHAEGRVEFIHAVVLPRGKSLD
Sheep Cattle Giant Human Chimpanzee Mouse Rat	QCAEILQKRTRAGQAGVSKPPKCRSRGSGFGGRPPPRSVFDFLNEKLKGGAPGAPEVGAA QCAEILQKRTRAGQAGVSKPPKCRSRGSGFGGRPPPRSVFDFLNEKLKGGAPGAPEVGAA QCAEILQKRTRGREPGAQRPPKCQSRGGTRPPSRNVFDFLNEKLQCAAPGALEARVA QCVETLQKQTRVGKAGTNKPPRCRGRGAAPGGRPAPRNVFDFLNEKLQGQAPGALEAGAA QCVETLQKQTRVGKAGTNKPPRCRGRGAAPGGRPAPRNVFDFLNEKLQGQAPGALEAGAA QCAEILQKKTKRGQAGSNRPPKCRRSGSRPEGRPPPRNVFDFLNEKLQSQVPGTPDAGVD QCAEILQKKTKQGQTGASRPPRCRRRSSRPEGRPPPRNVFDFLNEKLQSQVPGTPDAGVD **.* ***: : :
Cattle Giant	PPGR-SGKEVYHASRSTKRALSLRLLQTEEKIEQTQRAIRGIQEALARNAGRHSVTTTQL PPGR-SGKEVYHASRSTKRALSLRLLQTEEKIEQTQRAIRGIQEALARNAGRHSVTTTQL PPGRRSSKEMYHASKSAKRALSLQLFQTEKKIEQTQRDIRGIQKALARNTGRHSVTAQL PAGR-RSKDMYHASKSAKRALSLRLFQTEEKIERTQRDIRSIQEALARNAGRHSVASAQL PAGR-RSKDMYHASKSAKRALSLRLFQTEEKIERTQRDIRSIQEALARNAGRHSVASAQL TPER-RNKDMYHASKSAKQALSLQLFQTEEKIERTQRDIRGIQEALTRNTGRHNMTTAHL TPER-RNKDMYHASKSAKQALSLQLFQTEEKIERTQRDIRGIQEALTRNTGRHSMATAHL * .::***:::::::::****::****:********
Sheep Cattle Giant Human Chimpanzee Mouse Rat	QEKLAGAQRQLGQLRAQEAGLQREQRKADTHKKMTEF QEKLAGAQQQLGQLRAQEAGLQREQRKADTHKKMTEF QEKLAGAQRELGQLQAQEAGLQREQRKADTHKKMTEF QEKLAGAQRQLGQLRAQEAGLQQEQRKADTHKKMTEF QEKLAGAQRQLGQLRAQEAGLQQEQRKADTHKKMTEF QEKLEGAQRQLGQLRAQEADLQRKQRKADTHKKMTEF QEKLEGAQRQLGQLRAQEADLQRKQRKADTHRKMTEF QEKLEGAQRQLGQLRAQEADLQRKQRKADTHRKMTEF

Fig. 3: The alignment of the protein encoded by sheep ZGPAT gene and nine other kinds of ZGPAT proteins. Giant represents Giant panda

cattle (Accession No.: NP_001019685, 97%), Giant panda (Accession No.: XP_002925738; 84%), rabbit (Accession No.: XP_002708808; 99%), human (Accession No.: AAH32612, 79%), rat (Accession No.: NP_001009656; 76%), mouse (Accession No.: NP_659143; 77%) and chimpanzee (Accession No.: XP_003317102; 78%) (Fig. 3).

The sheep ZDHHC7 protein has high homology with the Zinc finger, DHHC-type containing 7 (ZDHHC7) proteins of nine species-cattle (Accession No.: XP_874326; 99%), dog (Accession No.: XP_546796; 93%),

pig (Accession No.: XP_003126871; 93%), human (Accession No.: NP_060210; 93%), Giant panda (Accession No.: XP_002913433; 93%), Northern white-cheeked gibbon (Accession No.: XP_003272546; 92%), mouse (Accession No.: NP_598728; 92%), white-tufted-ear marmoset (Accession No.: XP_002761264; 92%) and rat (Accession No.: NP_596885; 92%) (Fig. 4).

Based on the results of the alignment of ZFAND5, ZGPAT and ZDHHC7 proteins, three phylogenetic trees were constructed using the Dendrogram procedure of ClustalW software as shown in Fig. 5-7.

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Human	
	MQPSGHRLRDVEHHPLLAENDNYDSSSSSSSEADVADRVWFIRDGCGMICAVMTWLLVAY
Northern	MQPSGHRLRDVEHHPLLAENDNYDSSSSSSSEADVADRVWFIRDGCGMICAVMTWLLVAY
White-tufted-ear	MQPSGHRLRDVEHHPLLAENDNYDSSSSSSSEADVADRVWFIRDGCGMICAVMTWLLVAY
Rat	MQPSGHRLRDIEHHPLLTDNDNYDSASSSSSEADMADRVWFIRDGCGMVCAVMTWLLVVY
Mouse	MQPSGHRLRDIEHHPLLTDNDNYDSASSSSSETDMADRVWFIRDGCGMVCAVMTWLLVVY
Dog	MPSSGHRLRDVEHHPLLAENDSYDSSSSSSSEADMADRVWFIRDGCGMICAVMTWLLVVY
Giant	MPSSGHRLRDVEHHPLLAENDSYDSSSSSSSEADVADRVWFIRDGCGMICAVMTWLLVVY
Sheep	MPSSGHRLRDVEHHPLLTGDDSYDSAASSPAEADAADRVWFIRDGCGMICAVLTWLLVVY
Cattle	MPSSGHRLRDVEHHPLLTENDSYDSAASSPAEADAADRVWFIRDGCGMICAVLTWLLVVY
Pig	MPSPGHRLRDVEHHPLLSESDAYDSAPSSSSEADGADRVWFIRDGCGVVCAVLTWLLVVY
FIG	******:*****: .* ***: ** :* *********
Human	ADFVVTFVMLLPSKDFWYSVVNGVIFNCLAVLALSSHLRTMLTDPGAVPKGNATKEYMES
Northern	ADFVVTFVMLLPSRDFWYSVVNGVIFNCLAVLALSSHLRTMLTDPGAVPKGNATKEYMES
White-tufted-ear	ADFVVTFVMLLPSKDFWYSVVNGVIFNFLAVLALSSHLRTMLTDPGAVPKGNATKEYMES
Rat	ADFVVTFVMLLPSKDFWYSVVNGVLFNCLAVLALSSHLRTMLTDPGAVPKGNATKEYMES
Mouse	ADFVVTFVMLLPSKDFWYSVVNGVLFNCLAVLALSSHLRTMLTDPGAVPKGNATKEYMES
Dog	ADFVVTFVMLLPSKDFWYSVVNGVLFNCLAVLALSSHLRTMLTDPGAVPKGNATKEYMES
Giant	ADFVVTFVMLLPSKDFWYSVVNGVLFNCLVVLALSSHLRTMLTDPGAVPKGNATKEHMES
Sheep	ADFVVTFVMLLPSKDFWYSVVNGVVFNCLAVLALSSHLRTMLTDPGAVPKGNATKEYMES
Cattle	ADFVVTFVMLLPSKDFWYSVVNGVVFNCLAVLALSSHLRTMLTDPGAVPKGNATKEYMES
Pig	ADFVVTFVMLLPSKDFWYAVLNGVSFNCLAVLALSSHLRTMLTDPGAVPKGNATKEFMES

Human	${\tt LQLKPGEVIYKCPKCCCIKPERAHHCSICKRCIRKMDHHCPWVNNCVGEKNQRFFVLFTM}$
Northern	LQLKPGEVIYKCPKCCCIKPERAHHCSICKRCIRKMDHHCPWVNNCVGEKNQRFFVLFTM
White-tufted-ear	LQLKPGEVIYKCPKCCCVKPERAHHCSICKRCIRKMDHHCPWVNNCVGEKNQRFFVLFTM
Rat	LQLKPGEVIYKCPKCCCIKPERAHHCSICKRCIRKMDHHCPWVNNCVGEKNQRFFVLFTM
Mouse	LQLKPGEVIYKCPKCCCIKPERAHHCSICKRCIRKMDHHCPWVNNCVGEKNQRFFVLFTM
Dog	LQLKPGEVIYKCPKCCCIKPERAHHCSICKRCIRKMDHHCPWVNNCVGEKNQRFFVLFTM
Giant	LQLKPGEVIYKCPKCCCIKPERAHHCSICKRCIRKMDHHCPWVNNCVGEKNQRFFVLFTM
Sheep	LQLKPGEVIYKCPKCCCVKPERAHHCSICKRCIRKMDHHCPWVNNCVGEKNQRFFVLFTM
Cattle	LQLKPGEVIYKCPKCCCIKPERAHHCSICKRCIRKMDHHCPWVNNCVGEKNQRFFVLFTM
Pig	LQLKPGEVIYKCPKCCCIKPERAHHCSICKRCIRKMDHHCPWVNNCVGEKNQRFFVLFTM

Human	YIALSSVHALILCGFQFISCVRGQWTECSDFSPPITVILLIFLCLEGLLFFTFTAVMFGT
Northern	YIALSSVHALILCGFQFISCVRGQWTECSDFSPPITVILLIFLCLEGLLFFTFTAVMFGT
White-tufted-ear	YIALSSVHALILCGLQFISCVRGQWTECSDFSPPVTVILLTFLCLEGLLFFTFTAVMFGS
Rat	YIALSSIHALILCGLQFISCVRGQWTECSDFSPPITVILLVFLCLEGLLFFTFTAVMFGT
Mouse	YIALSSVHALILCGLQFISCVRGQWTECSDFSPPITVILLVFLCLEGLLFFTFTAVMFGT
Dog	YIALSSVHALILCGLOFVSCVRGOWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT
Dog Giant	YIALSSVHALILCGLQFVSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALSSVHALILCGLOFVSCVRGOWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT
Giant	YIALSSVHALILCGLQFVSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT
Giant Sheep	YIALSSVHALILCGLQFVSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT
Giant Sheep Cattle	YIALSSVHALILCGLQFVSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT
Giant Sheep	YIALSSVHALILCGLQFVSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSGFSPPVTVILLIFLCLEGLLFFTFTAVMFGT
Giant Sheep Cattle	YIALSSVHALILCGLQFVSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT
Giant Sheep Cattle	YIALSSVHALILCGLQFVSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSGFSPPVTVILLIFLCLEGLLFFTFTAVMFGT
Giant Sheep Cattle Pig	YIALSSVHALILCGLQFVSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSGFSPPVTVILLIFLCLEGLLFFTFTAVMFGT ****:***:***:**:**:***:****:**********
Giant Sheep Cattle Pig Human Northern	YIALSSVHALILCGLQFVSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSOFSPPVTVILLIFLCLEGLLFFTFTAVMFGT ****:***:***:**:***:*****************
Giant Sheep Cattle Pig Human Northern White-tufted-ear	YIALSSWHALILGGLQFYSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVIGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSGFSPPVTVILLIFLCLEGLLFFTFTAVMFGT ****:********************************
Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat	YIALSSVHALILCGLQFVSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSGFSPPVTVILLIFLCLEGLLFFTFTAVMFGT ****:****:***:***:*******************
Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse	YIALSSVHALILCGLQFVSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSGFSPPVTVILLIFLCLEGLLFFTFTAVMFGT ****:*****:***:***:******************
Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog	YIALSSWAALILGGLQFYSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSGFSPPVTVILLIFLCLEGLLFFTFTAVMFGT ****:********************************
Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog Giant	YIALSSVHALILCGLQFYSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSGFSPPVTVILLIFLCLEGLLFFTFTAVMFGT ****:****:***:***:*******************
Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog Giant Sheep	YIALSSVHALILCGLQFVSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSGFSPPVTVILLIFLCLEGLLFFTFTAVMFGT ****:*****:***:***:******************
Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog Giant Sheep Cattle	YIALSSWHALILGGLQFYSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSGFSPPVTVILLIFLCLEGLLFFTFTAVMFGT ************************************
Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog Giant Sheep	YIALSSVHALILCGLQFVSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVAGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSGFSPPVTVILLIFLCLEGLLFFTFTAVMFGT ****:****:**:***:********************
Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog Giant Sheep Cattle	YIALSSWHALILGGLQFYSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSGFSPPVTVILLIFLCLEGLLFFTFTAVMFGT ************************************
Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog Giant Sheep Cattle	YIALSSVHALILCGLQFVSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVAGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSGFSPPVTVILLIFLCLEGLLFFTFTAVMFGT ****:****:**:***:********************
Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog Giant Sheep Cattle Pig	YIALSSWHALULGQL@FISCURGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVIGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVRGQWTECSDFSPPVTVILLIFLCLEGLLFTFTAVMFGT YIALASVHALVLCGLQFISCURGQWTECSGFSPPVTVILLIFLCLEGLLFFTFTAVMFGT ************************************
Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog Giant Sheep Cattle Pig Human	YIALSSVHALILCGLQFYSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGGWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSGFSPPVTVILLIFLCLEGLLFFTFTAVMFGT ****:********************************
Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog Giant Sheep Cattle Pig Human Northern	YIALSSVHALILCGLQFYSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHAUVLCGLQFIACVLGGWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHAUVLCGLQFIACVAGGWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHAUVLCGLQFISCVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSGFSPPVTVILLIFLCLEGLLFFTFTAVMFGT ****:****:***:***:*******************
Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat	YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSOFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSOFSPPVTVILLIFLCLEGLLFFTFTAVMFGT ****:********************************
Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse	YIALSSVHALILCGLQFYSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVAGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSGFSPPVTVILLIFLCLEGLLFFTFTAVMFGT ****:****:***:***:*******************
Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog	YIALASVHALVICGLQFIACVLGQWTECSDFSPPVTVILLIFICLESLLFFTFTAVMFGT YIALASVHALVICGLQFIACVLGQWTECSDFSPPVTVILLIFICLEGLLFFTFTAVMFGT YIALASVHALVICGLQFIACVRGQWTECSDFSPPVTVILLIFICLEGLLFFTFTAVMFGT YIALASVHALVICGLQFISCVRGQWTECSDFSPPVTVILLIFICLEGLLFFTFTAVMFGT YIALASVHALVICGLQFISCVRGQWTECSGFSPPVTVILLIFICLEGLLFFTFTAVMFGT ************************************
Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse	YIALSSVHALILCGLQFYSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVAGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSGFSPPVTVILLIFLCLEGLLFFTFTAVMFGT ****:****:***:***:*******************
Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog Giant Sheep Cattle Pig	YIALSSWHALILCGLQFVSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT ************************************
Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog Giant Sheep Cattle Pig	YIALSSVHALILCGLQFYSCVRGQWTECSDFSPPVTVILLIFLCLESLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVLGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFIACVAGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSDFSPPVTVILLIFLCLEGLLFFTFTAVMFGT YIALASVHALVLCGLQFISCVRGQWTECSGFSPPVTVILLIFLCLEGLLFFTFTAVMFGT ****:****:**:***:********************
Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog Giant Sheep Cattle Pig Human Northern White-tufted-ear Rat Mouse Dog Giant Sheep Cattle Pig	YIALASVHALVICGLQFIACVLGQWTECSDFSPPVTVILLIFICLESLLFFTFTAVMFGT YIALASVHALVICGLQFIACVLGQWTECSDFSPPVTVILLIFICLEGLLFFTFTAVMFGT YIALASVHALVICGLQFIACVRGQWTECSDFSPPVTVILLIFICLEGLLFFTFTAVMFGT YIALASVHALVICGLQFISCVRGQWTECSDFSPPVTVILLIFICLEGLLFFTFTAVMFGT YIALASVHALVICGLQFISCVRGQWTECSGFSPPVTVILLIFICLEGLLFFTFTAVMFGT ************************************

Fig. 4: The alignment of the protein encoded by sheep ZDHHC7 gene and ten other kinds of ZDHHC7 proteins. White-tufted-ear represents white-tufted-ear marmoset; Giant represents giant panda; Northern represents Northern white-cheeked gibbon

The phylogenetic analysis revealed that the sheep ZFAND5, ZGPAT and ZDHHC7 genes all have a closer genetic relationship with the ZFAND5, ZGPAT and ZDHHC7 genes of cattle.

Tissue expression profile: Tissue expression profile analysis was carried out and results revealed that the sheep *ZFAND5*, *ZGPAT* and *ZDHHC7* genes are all generally but differentially expressed in tissues including

spleen, lung, muscle, kidney, ovary, skin, liver, heart and fat (Fig. 8). In the current study, we firstly get the coding sequences of sheep *ZFAND5*, *ZGPAT* and *ZDHHC7* genes by RT-PCR. With the development of modern bioinformatics, establishment of specific sheep NCBI EST database and different convenient analysis tools, researchers can easily find the useful ESTs which were highly homologous to the coding sequences of human genes. Based on these sheep EST sequences, researchers

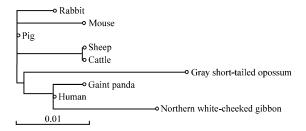


Fig. 5: The phylogenetic analysis for nine kinds of ZFAND5 genes

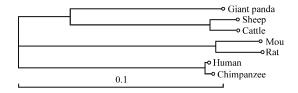


Fig. 6: The phylogenetic analysis for seven kinds of ZGPAT genes

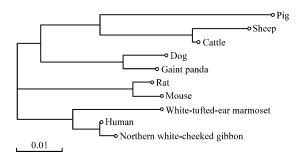


Fig. 7: The phylogenetic analysis for ten kinds of ZDHHC7 genes

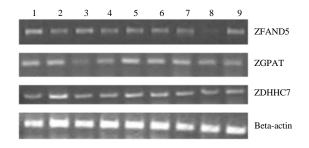


Fig. 8: Tissue expression distribution of sheep ZFAND5, ZGPAT and ZDHHC7 genes. The beta-actin expression is the internal control.1: muscle; 2: heart; 3: lung; 4: spleen; 5: skin; 6: fat; 7: liver; 8: kidney and 9: ovary

can obtain the complete coding sequences of some novel sheep genes through the some experimental methods such as RT-PCR. From the clone and sequence analysis of sheep ZFAND5, ZGPAT and

ZDHHC7 genes, it could be seen that this is an effective method to isolate some novel sheep genes. Through sequence analysis, researchers found that the encoding protein of the sheep ZFAND5, ZGPAT and ZDHHC7 genes are highly homologous with ZFAND5, ZGPAT and ZDHHC7 proteins of human and some other animals. This implied that the ZFAND5, ZGPAT and ZDHHC7 genes were highly conserved in some species and the sheep ZFAND5, ZGPAT and ZDHHC7 genes will have similar functions as the ZFAND5, ZGPAT and ZDHHC7 genes of human and other animals.

The researchers also found that the sheep ZFAND5, ZGPAT and ZDHHC7 proteins do not show complete identity to some animals. This implied that the sheep ZFAND5, ZGPAT and ZDHHC7 genes will have some differences in functions to those of other animals.

The phylogenetic analysis revealed that the sheep ZFAND5, ZGPAT and ZDHHC7 genes all have a closer genetic relationship with the ZFAND5, ZGPAT and ZDHHC7 genes of cattle. This implied that we can use cattle as a model organism to study the sheep ZFAND5, ZGPAT and ZDHHC7 genes or use sheep as a model organism to study the cattle ZFAND5, ZGPAT and ZDHHC7 genes.

From the tissue distribution analysis in this experiment it can be seen that the sheep ZFAND5, ZGPAT and ZDHHC7 genes were obviously differentially expressed in some tissues.

As researchers did not study functions at protein levels yet, there might be many possible reasons for differential expression of sheep ZFAND5, ZGPAT and ZDHHC7 genes. The suitable explanation for this under current conditions is that at the same time those biological activities related to the mRNA expression of sheep ZFAND5, ZGPAT and ZDHHC7 genes were presented diversely in different tissues.

CONCLUSION

In this study, the researchers first isolated the sheep ZFAND5, ZGPAT and ZDHHC7 genes and performed necessary sequence and tissue expression profile analysis. This established the primary foundation for further insight into these novel sheep genes.

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