



# Molecular characterization and functional analysis of sheep thyroid transcription factor-1

L.P. Zhang\*, B.Y. Ma\*, F.X. Han, H.L. Wan, J.P. Wu, L.H. Yu, X.R. Wang and J.Y. Zhu

College of Animal Science and Technology, Gansu Agricultural University, Lanzhou, China

\*These authors contributed equally to this study.

Corresponding author: L.P. Zhang

E-mail: zhangliping@gsau.edu.cn

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**ABSTRACT.** Thyroid transcription factor-1 (TTF-1), a member of the Nkx2 family of homeodomain-containing proteins, is involved in binding to and in activating the promoters of several important genes in the thyroid, lungs, and brain, and in regulating expression of these tissue-specific genes. We investigated potential roles of sheep (*Ovis aries*) TTF-1 in regulating cell fate and organ morphogenesis and in controlling puberty and reproductive capability of females. We amplified and cloned the sheep TTF-1 full-length DNA for the first time, analyzed its functional domains and regions, predicted molecular structure of its homeodomain and DNA-binding sites, and examined its expression in pituitary, brain, thyroid gland, ovary, and hypothalamus. We found that sheep TTF-1 has a high degree of homologous identity with that of other mammals, and it has several important domains including domain N, DNA-binding domain, domain C, TN-domain, domain I, and NK2-SD. The DNA-binding domain of sheep TTF-1 has 10 potential DNA-binding sites and is a novel mammalian homeodomain that shows considerable sequence homology with the corresponding rat homeodomain. Several functional regions in sheep TTF-1 share high sequence identity with rat TTF-1, indicating that these regions may have the same activity as in the rat. Expression of TTF-1 in several specific tissues implies that sheep TTF-1 is involved in sheep sexual development and reproductive capability. These results suggest a

role of sheep TTF-1 in enhancing sheep reproduction performance and we propose it as a candidate gene for selection.

**Key words:** Sheep; TTF-1; Domain; Homeodomain; Candidate gene