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Keratin Transgenesis in Sheep

Produced for the CRC for Premium Quality Wool undergraduate program by;
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Genes for Many of the Sheep Wool Structural Proteins Have Been Cloned

- Expression patterns for these genes have been determined.
- A complex pattern of gene expression is needed to produce a wool fibre.
- Expression patterns in the different fibre compartments govern fibre properties.
 - crimp frequency
 - intrinsic strength
 - surface properties

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Current Sheep Transgenes

DNA Construct	Promoter-coding region	Protein product	Injection status / lambing
Keratin 1	K2.10 - K2.10	Type II IF	6 G ₀ , G ₁ , G ₂ , G ₃
Keratin 2	MK2.10 - K2.10	Type II IF	4 G ₀
Keratin 3	K2.10 - KAP 5	Cys-rich, cuticle	9 G ₀ , G ₁
Keratin 4	K2.10 - Transglut.	Crosslinking enzyme	2 G ₀ , G ₁
Keratin 5	K2.10 - KAP4.2	Cys-rich, paracortex	9 G ₀ , G ₁
Keratin 6	K2.10 - KAP6.1	Gly/tyr-rich, orthocortex	9 G ₀ , G ₁
Keratin 7	KAP2 - Transglut.	Crosslinking enzyme	3 G ₀
Keratin 8	K2.10 - IGF1	Growth Factor	No transgenic lambs
Keratin 9 (Mix)	K2.10 - K1.2 & MK2.10 - K2.10	Type I IF	<i>In vitro</i> lambs
Keratin 9 (Mix)	K2.10 - K1.2 & MK2.10 - K2.10	Type II IF	No G ₀ transgenics
Keratin 10	K2.10 - K1.1 & MK2.10 - K2.10	Type I IF	<i>In vivo</i> lambs
Keratin 10	K2.10 - K1.1 & MK2.10 - K2.10	Type II IF	4 G ₀
Keratin 10	K2.10 - K1.1 & MK2.10 - K2.10	Type I IF	No G ₀ transgenics
Keratin 10	K2.10 - K1.1 & MK2.10 - K2.10	Type II IF	Lambs
Keratin 11	K2.10 - KAP1	Cysteine-rich, cortex	4 G ₀

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Summary

- **Transgenesis is a useful tool**
 - analysis of control of gene expression
 - gene-specific alteration of the sheep genotype
- **Keratin gene transgenesis will enable...**
 - alteration of the protein composition of wool
 - alteration of the properties of wool fibres
- **and may facilitate...**
 - novel protein-protein interactions in the fibre
 - improved fibre quality

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