CRC for Premium Quality Wool

K2.10 Transgenic Sheep

Produced for the CRC for Premium Quality Wool undergraduate program by;
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Modification of the fleece of sheep via transgenesis with Wool Keratin genes

- Protein Composition = Processing and Wearing Properties
- First sheep transgenesis with wool intermediate filament keratin gene, K2.10, as used in mice.
  - moderate expression of the transgene is tolerated
  - high-level transgene expression led to altered fibre structure

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K2.10 Transgenesis

- **Transgene : 14.4 kb DNA fragment**
  - pronuclear microinjection
  - randomly integrated into genome
  - stably inherited by G1 and G2 progeny
  - transgenics are healthy and fertile
  - some fleeces visibly different to controls
  - G0 animals express transgenes at different levels
- **Transgene K2.10 expression pattern is identical to endogenous K2.10 gene expression**

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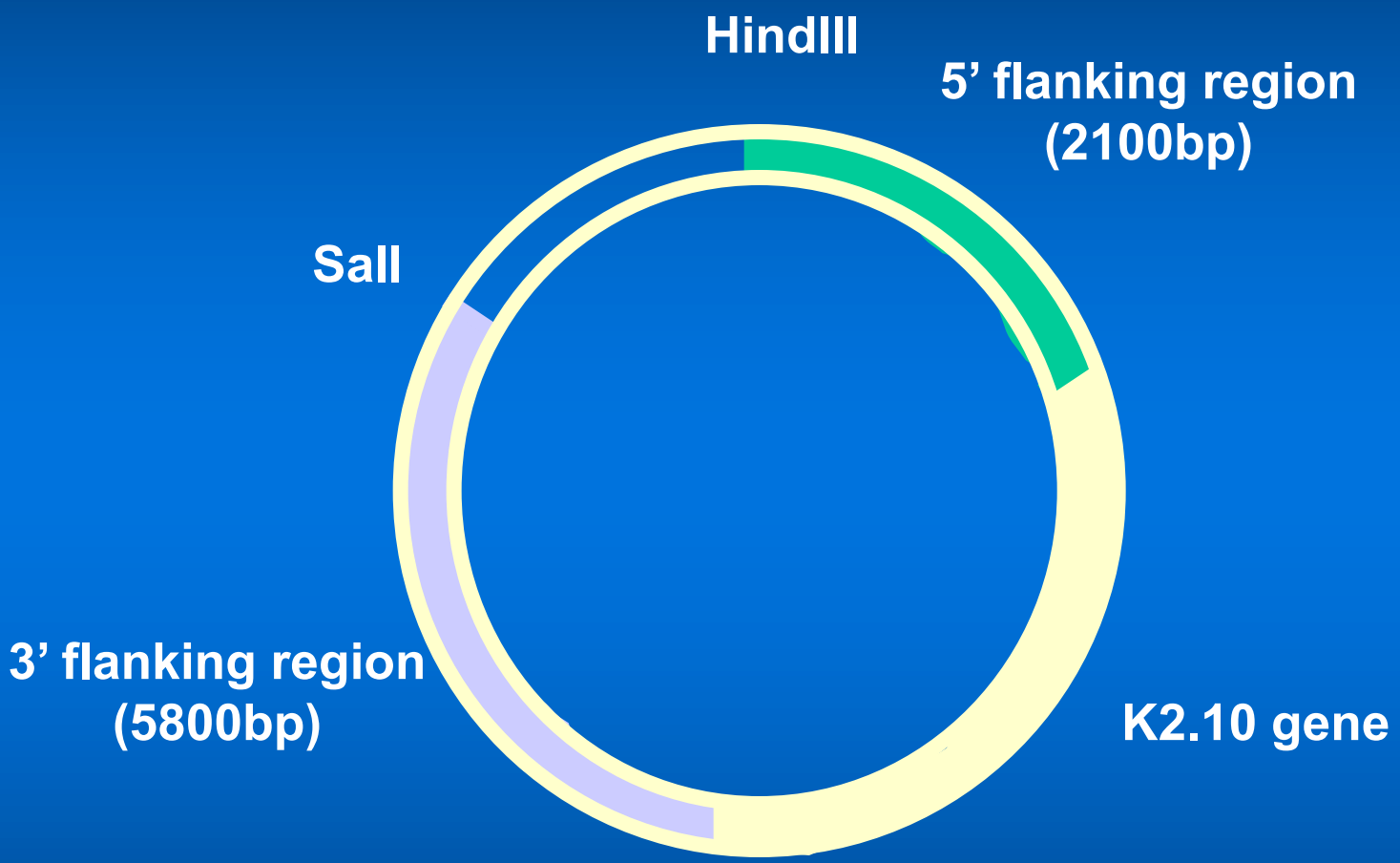
K2.10 Gene inserted into sheep



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Sheep	Sex	Transgene number	Transgene expression relative to endog. K2.10 gene (1.0)	Visible effect on phenotype fleece
G0 #80	M	12	1.0	Yes
G1 #80.263	F	30 (2)	3.6	Yes
G1 #80.367	M	30	3.5#	Yes
G1 #80.370	M	30	3.8#	Yes
G1 #80.392	F	30	1.9	Yes
G0 #93	M	4 (3)	0.1	No
G1 #93.255	M	4	0.05	No
G1 #93.256	F	4	0.2	No
G1 #93.260	F	4	0.2	No
G0 #94	F	1	n.d.	No
G0 #131	M	2 (1)	n.d.	No
G0 #609A *	M	1	n.d.	n.d.
G0 #609B *	F	2	n.d.	n.d.

* : lambs dead at birth

n.d. : not determined

: Transgene expression level determined by single Northern transfer hybridisation result. All others determined by analysis of multiple Northern hybridisations.

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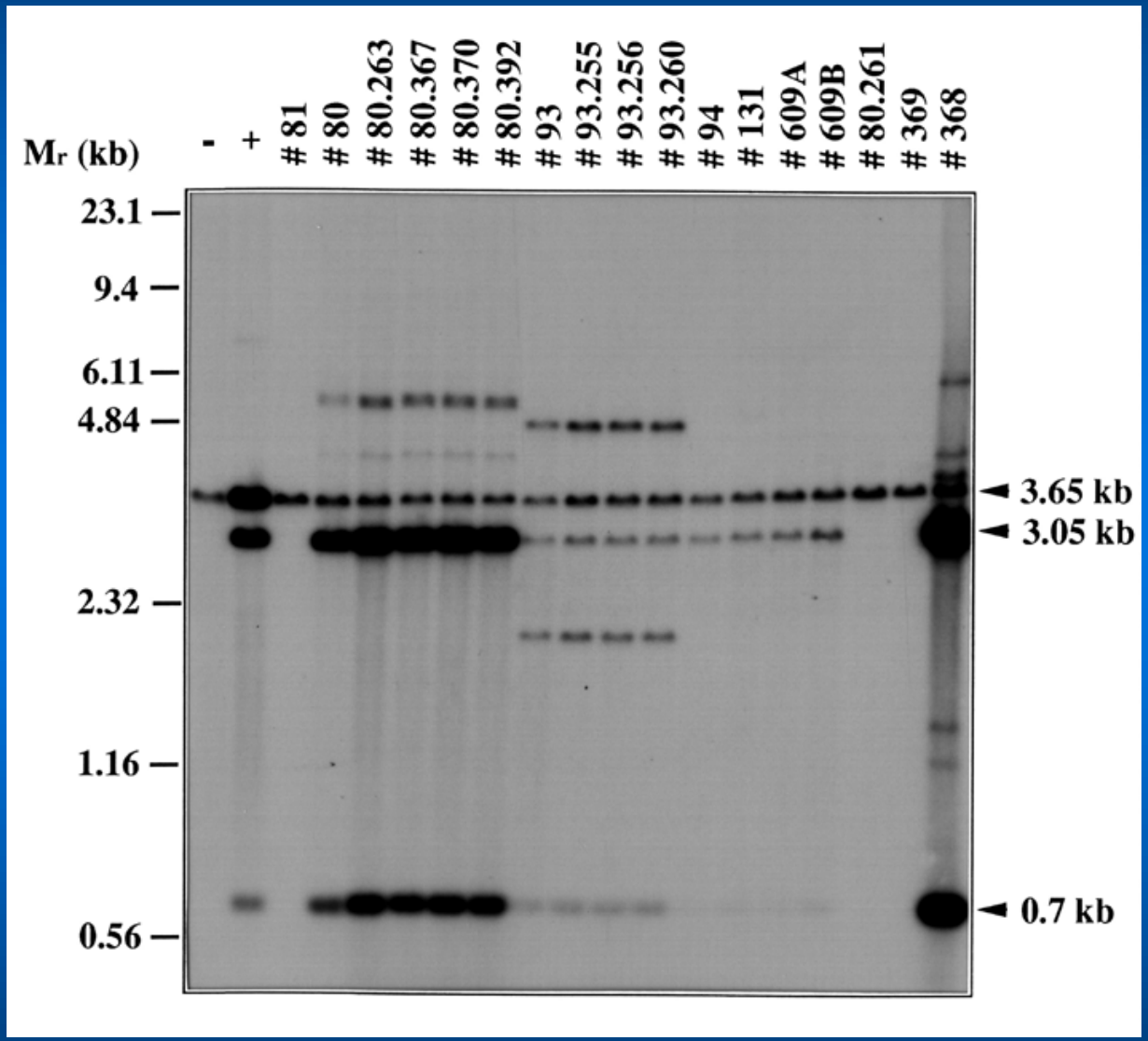
Source: Bawden et al. (1998)

Inheritance of K.2.10 transgene



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Source: Bawden et al. (1998)

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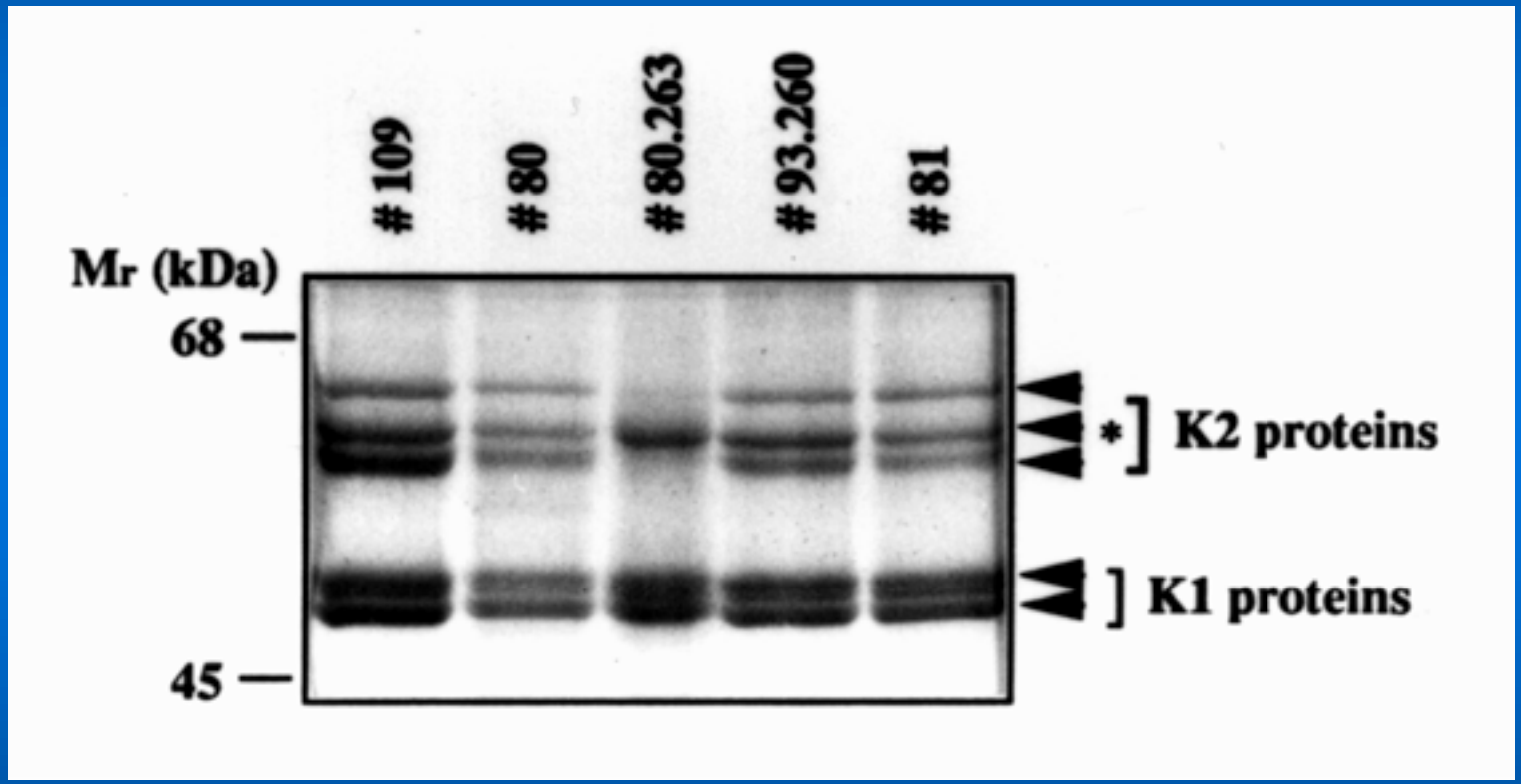
Protein production in K2.10 transgenic sheep



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Source: Bawden et al. (1998)

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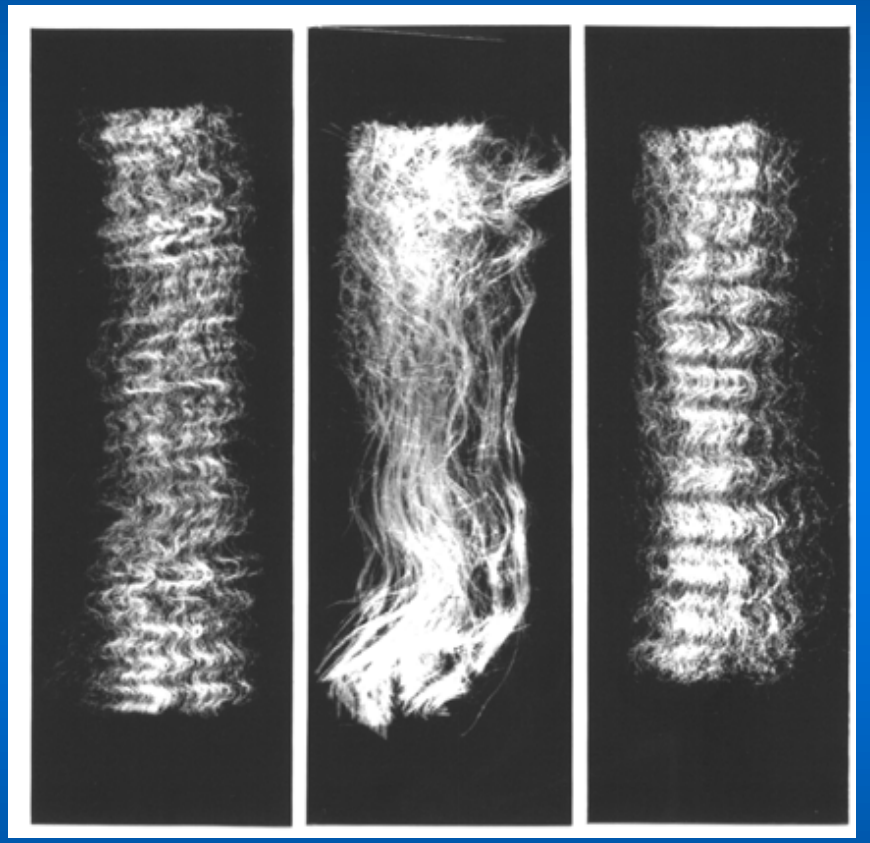
K2.10 transgenic sheep and staples



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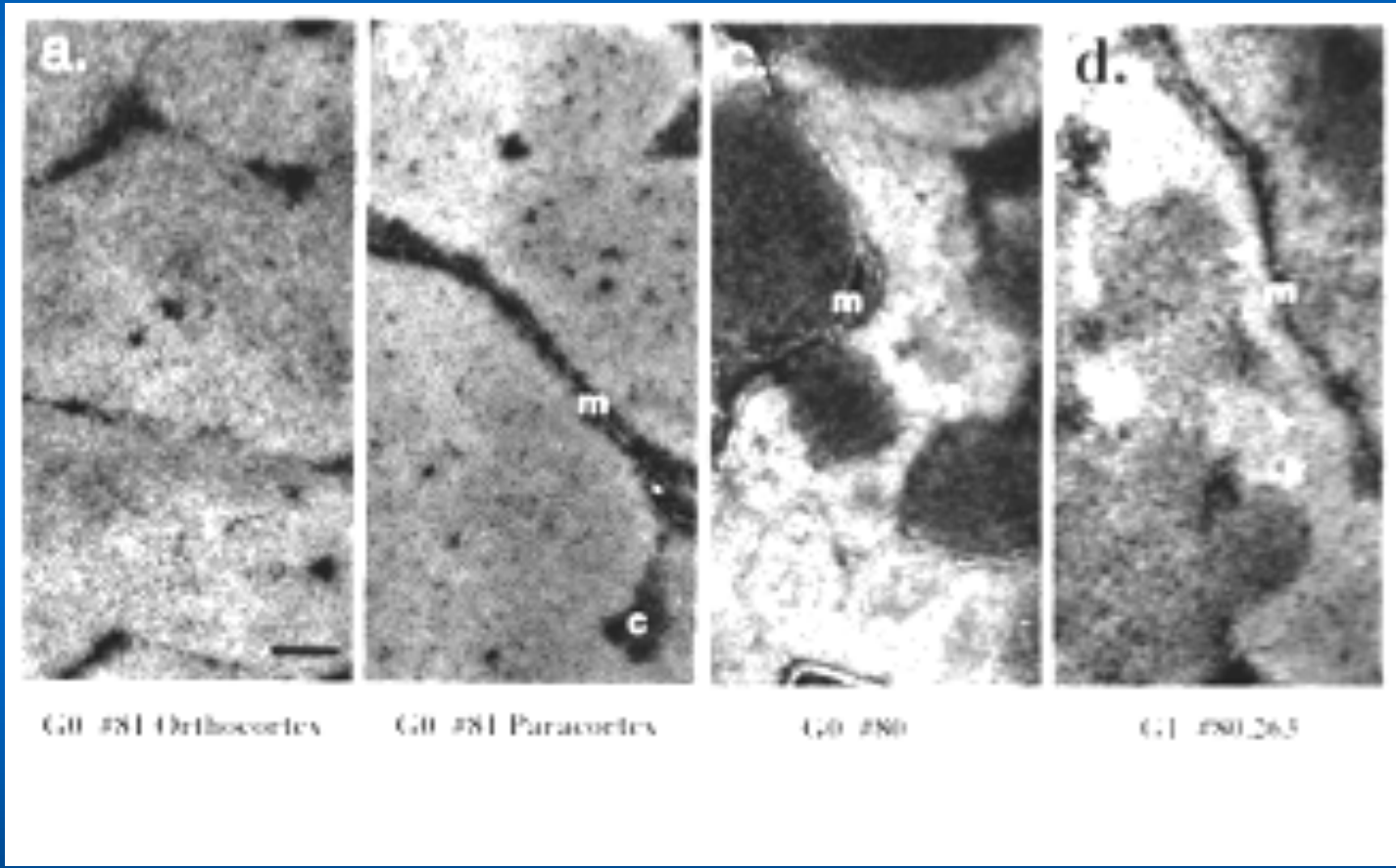
Wool fibre cortical cells from K2.10 transgenic sheep



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High-level K2.10 transgene expression leads to ...

- depression of endogenous keratin gene expression
- reduction in endogenous keratin protein synthesis
- perturbation of normal fibre structure
- reduction in intrinsic fibre strength

- **Effects :**
  - alteration of protein composition
  - alteration of normal pattern / timing of protein-protein interactions.

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