



CRC

for

Premium

Quality

Wool

# Keratin Structure

Produced for the CRC for Premium Quality Wool undergraduate program by;  
Mr. Kevin Ley, CSIRO Textile & Fibre Technology, and  
Dr Barry Powell & Dr. C. Simon Bawden, The University of Adelaide.



# Molecules of the wool IF (the low sulfur proteins)

- Amino acids join together to form a single protein chain
  - the low-S protein molecule
- Two protein chains interact, with their  $\alpha$ -helical regions forming a coiled-coil
  - the dimer
- Two dimers interact, with their coiled-coil regions antiparallel and staggered with respect to each other
  - the tetramer
- Tetramers align end to end
  - the subfilament
- Subfilaments are bundled together and staggered with respect to each other
  - the intermediate filament

CRC

for

Premium

Quality

Wool



CRC

for

Premium

Quality

Wool

# Matrix

- Intermediate filaments are embedded in a non-filament matrix
  - Intermediate filament associated protein
    - high-sulfur proteins
      - » rich in half-cystine, serine, proline, and threonine
    - high-glycine-tyrosine proteins
      - » very rich in glycine and tyrosine.
  - Disulfide bonding of high-sulfur proteins mostly intramolecular rather than intermolecular.
    - But some of the disulfide bonding within the matrix is likely to be intermolecular, connecting high-sulfur protein chains to other high-sulfur protein chains and also to low-sulfur protein chains of the intermediate filaments.
- The combination of the IFs and IFAPs is the basic structure of mammalian hard  $\alpha$ -keratins



# Summary of protein types in fibres

Group	Protein	Families	Component s	Number of genes
<b>Keratin IF</b>	<b>IF type I</b>	<b>K1. n</b>	<b>+ cuticle</b>	<b>4+</b>
	<b>IF type II</b>	<b>K2. n</b>		<b>4+</b>
<b>Keratin IF associated protein (matrix)</b>	<b>Cys-rich</b>	<b>KAP1, 2, 3, 11</b>	<b>(HS)</b>	<b>≥20</b>
		<b>KAP4, 9, 12</b>	<b>(UHS)</b>	<b>≥10</b>
		<b>KAP5, 10</b>	<b>cuticle</b>	<b>≥10</b>
	<b>Gly/tyr-rich</b>	<b>KAP6, 7 8</b>	<b>(type I &amp; II)</b>	<b>~10</b>

CRC

for

Premium

Quality

Wool