Metabolic Activity of the Follicle

Produced for the CRC for Premium Quality Wool undergraduate program by;
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Cell division in wool follicles

- in an average sheep, 2 billion follicle bulb cells divide per hour
  - approx 800 cells/bulb
    - bulb turnover time is 20 hours
  - 40 divide per hour
  - 50 million bulbs per sheep

17 trillion bulb cells produced per year!
An average sheep produces 7300km wool per year

• 400µm/day length x 50 million follicles/sheep
  – 20 km of fibre length/day
  = 7,300 km wool/year

But only 1.6% of skin area is fibre

– For example, for a 20µm fibre
  \[3.14 \times 10^{-4} \times 50/\text{mm}^2\]
  \[= 0.016 \text{ mm}^2 / \text{mm}^2 \text{ skin}\]
Skin has a high rate of protein synthesis

- Skin equals about 10% of body weight

  BUT

- Accounts for 10-20% of whole body protein synthesis

- Accounts for 150% of the maintenance protein requirements
## Energy utilisation in follicles

<table>
<thead>
<tr>
<th>Process</th>
<th>moles ATP x 10^{-12}</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNA synthesis</td>
<td>0.11</td>
</tr>
<tr>
<td>RNA synthesis</td>
<td>0.90</td>
</tr>
<tr>
<td>Protein synthesis</td>
<td>36.04</td>
</tr>
<tr>
<td>Protein turnover</td>
<td>9.01</td>
</tr>
<tr>
<td>Amino acid transport</td>
<td>9.01</td>
</tr>
<tr>
<td>Na/K transport</td>
<td>6.10</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>61.17 x 10^{-12}</strong> moles ATP</td>
</tr>
</tbody>
</table>