mohair. Cashmere production is strongly seasonal while that for mohair is essentially perennial with at least 0·75 of secondary follicles considered to be in the active phase at any one time. The hair growth cycle of many mammals can be manipulated by changes in photoperiod or treatment with melatonin or prolactin. The objective of this study was to study the effects of prolactin and melatonin using our recently developed *in vitro* follicle culture method. Cashmere and mohair secondary hair follicles were isolated from skin samples taken immediately *post mortem* and incubated in Multiwell plates in Williams E medium unsupplemented (O) or supplemented with concentrations of melatonin (M, ng/l), prolactin (P, μg/l) or prolactin + melatonin (M + P) as follows: 0, 50P, 200P, 400P; 50M, 150M, 300M; 400P + 50M, 400P + 150M, 400P + 300M; 150M + 50P, 150M + 200P. Cumulative totals (mm) for hair shaft elongation after 120 h incubation and significance of differences (* = $P < 0·05$) between follicles unsupplemented (O) and those supplemented with M, P or M + P were as follows: (a) for cashmere 0·58, 0·65, 0·66, 0·78*, 0·57, 0·83*, 0·67, 0·57, 0·53, 0·62, 0·64, 0·55 (pooled s.e. = 0·028) and (b) for mohair, 1·06, 1·14, 1·27*, 1·41*, 1·28*, 1·29*, 1·37*, 1·20*, 1·29*, 1·09, 1·46*, 1·16 (pooled s.e. = 0·044). The results suggest that both melatonin and prolactin when given individually may stimulate hair shaft elongation suggesting a direct effect of these hormones on the follicles. The combinations of M + P maintained the stimulation produced by the hormones given separately for mohair, but not cashmere follicles. Whether the differences in response to the combined treatments are associated with the differences in the *in vivo* hair growth pattern will require further investigation.

219. *In vitro* fibre production and protein deposition in secondary hair follicles of the cashmere and Angora goat

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Cashmere and mohair are fibres produced by secondary hair follicles of cashmere and Angora goats. Mohair is produced in greater quantities and unlike cashmere its growth is essentially independent of photoperiod. This study, using our established *in vitro* technique, investigated how protein synthesis in the follicle may contribute to differences in *in vivo* hair growth yields in both goat genotypes. Comparisons of differences for fibre volume (based on length and diameter) suggest that mohair production is 4·03 and 4·88 fold greater *in vivo* and *in vitro* respectively than that for cashmere in the goats studied. Skin samples from the mid-rib area of four cashmere and three Angora goats were taken immediately *post mortem*. Secondary hair follicles were isolated from the dermal layer and maintained using established tissue culture media and conditions. The follicles were pulsed at time 0 h with [U-^{14}C]-leucine. Follicles were homogenized and assayed for DNA concentration and measurements of incorporation of radiolabel were made after 1, 3 and 6 h of incubation, in the perchloric acid-insoluble protein fraction. Results obtained for cashmere and mohair follicles respectively are as follows: DNA concentration, 14·8 *v.* 69·0 (s.e.d. 2·06) ng per follicle ($P < 0·001$); [U-^{14}C]-leucine incorporation, 67·4 *v.* 131 (s.e.d. 8·61) pmoles leucine per μg DNA per 3 h ($P < 0·001$) and 0·9 *v.* 6·9 (s.e.d. 0·39) pmoles leucine per follicle per 3 h ($P < 0·001$). Incorporation of [U-^{14}C]-leucine was linear over the 6 h time period of study. The results suggest that compared with cashmere, mohair follicles have (a) greater cellularity as indicated by the greater amounts of DNA present per follicle and (b) greater apparent cellular rates (per μg DNA) and total rates (per follicle) of protein deposition measured on the basis of [U-^{14}C]-leucine incorporation. These results are consistent with the hair production differences observed *in vivo*.

220. Effect of isolation stress on β-endorphin and LH levels in ovariectomized ewes

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The objective of this experiment was to study the effect of the psychological stress of isolation on luteinizing hormone (LH) secretion in ovariectomized ewes. Sheep were initially penned in pairs. Isolation was accomplished by removing the non-experimental sheep to another room. The trials lasted from 10.00 h until 18.00 h. In the first stage (from 10.00 until 14.00 h) the animals were allowed to have visual contact with their partners, while in the second stage (14.00 until 18.00 h) the animals were isolated. Blood samples were taken at 15-min intervals throughout the experiment from jugular catheters implanted the previous day. Samples were analysed for glucose, β-endorphin and LH. The isolation stress caused a significant ($P < 0·05$) elevation of β-endorphin (316 (s.e. 11·4) *v.* 381 (s.e. 20·7) ng/l) but did not alter significantly ($P > 0·05$) the mean LH levels (4·23 (s.e. 0·14) *v.* 3·92 (s.e. 0·13) μg/l). However LH secretion was seen to decline rapidly after the onset of isolation and then to recover. When the data were analysed in 2-h time periods the LH levels were significantly ($P < 0·05$) reduced betwen the 2 h before (4·70 (s.e. 0·2) μg/l) and after (3·90 (s.e. 0·2) μg/l) isolation. LH pulse analysis performed using PULSAR showed that the pulse frequency and pulse amplitude were reduced after isolation (3·8 (s.e. 1·2) *v.* 3·3 (s.e. 1·1) pulses per 4 h) and (2·6 (s.e. 1·5) *v.* 1·6 (s.e. 1·0) μg/l), respectively. Glucose levels showed significant ($P < 0·05$) elevation (2·7 (s.e. 0·1) *v.* 3·2 (s.e. 0·1) nmol/l) during isolation stress. We can conclude that a psychological stress such as isolation in a species such as the sheep stimulates opioid peptides release and inhibits LH secretion. Whether these two events are causally linked remains to be clarified.

221. Oestrous activity and ovulation rate in Rasa Aragonesa ewes maintained at two different body condition levels implanted or reimplanted in the seasonal anoestrus with exogenous melatonin

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The effects of body condition (BC) score (≤2·50 (L) and ≥2·75 (H)) and implant (M) or reimplant (2M) of exogenous melatonin (Melovine™) on onset of oestrous activity and ovulation rate (OR) after implant insertion were studied. Forty-seven Spanish adult Rasa Aragonesa ewes housed throughout the year under natural daylength conditions at 42°40'N were used. Melatonin implants were placed 8 April for all animals and 49 days later for 2M groups. Oestrus was tested daily using aproned rams and OR 6 days after positive identification. Mean BC levels were similar at the beginning (2·50 (s.e. 0·03) *v.* 2·92 (s.e. 0·05)) and at the end (2·48 (s.e. 0·11) *v.* 2·91 (s.e. 0·11)) of the studied period for L and H groups respectively ($P < 0·05$). The H group showed a shorter seasonal anoestrus than the L one: 65 (s.e. 9·98) *v.* 122 (s.e. 11·47) days ($P < 0·01$). No significant differences were found on OR in the first (1·65 (s.e. 0·12) *v.* 1·46 (s.e. 0·10)) and second oestrus (1·56 (s.e. 0·12) *v.* 1·48 (s.e. 0·11) corpora lutea) exhibited starting on 1 month after first melatonin implant for L and H ewes respectively, although OR was slightly higher in L group, suggesting that melatonin implants were effective in ewes with a moderately low BC level. However, OR at the third oestrus was higher in H ewes ($P < 0·05$). No effect of reimplant with exogenous melatonin on the OR was detected. It is concluded that oestrous activity in the early breeding season could be stimulated by a moderately high and constant BC level. The effect of the melatonin implants on the OR at first and second oestrus of the breeding season could be more pronounced for ewes on a moderately low as opposed to moderately high BC level.

222. Effects of body condition and level of nutrition before mating on fertility of Awassi ewes

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Twelve weeks before mating 234 Awassi ewes aged 8·5 to 2·5 years were allocated to a 3 × 3 design with three body condition scores: