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**UNIVERSIDADE FEDERAL DE PELOTAS**  
**PROGRAMA DE PÓS-GRADUAÇÃO EM MEDICINA VETERINÁRIA**



O efeito a longo prazo da restrição alimentar e a sobre-alimentação no escore de condição corporal, metabólitos sanguíneos e perfil hormonal em ovelhas

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Mestrando em Medicina Veterinária



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# The effect of long-term feed restriction and over-nutrition on body condition score, blood metabolites and hormonal profiles in ewes

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# Objetivo

Parâmetros sanguíneos, ECC



status nutricional e metabólico





# Escore de condição corporal (ECC)

- Ferramenta de campo

Programas de alimentação



Apófise Espinhosa proeminente e definida

Ausência de cobertura de Gordura

Apófise Transversa Definida

Dedos entram sob o final da Apófise transversa

Apófise Espinhosa Proeminente

Fina Cobertura de Gordura

Músculo de profundidade média

Apófise Transversa Arredondada

Leve pressão para colocar os dedos sob o final da Apófise Transversa

Apófise Espinhosa Arredondada

Moderada Cobertura de Gordura

Músculo Volumoso

Apófise Transversa Arredondada

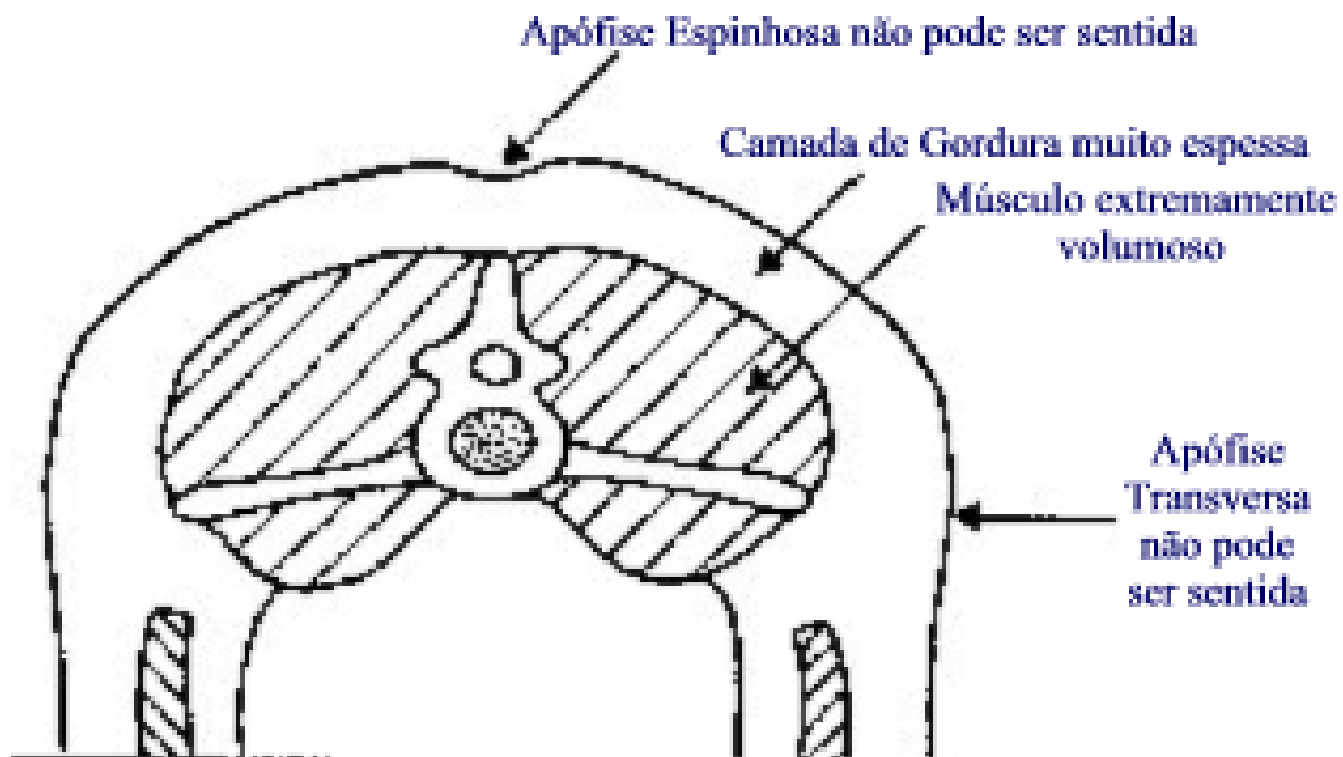
Pressão forte para colocar os dedos sob a Apófise Transversa

Apófise Espinhosa detectada como uma linha dura

Espessa camada de Gordura

Músculo Volumoso

Apófise Transversa não pode ser sentida



# Requerimentos nutricionais dos ovinos

## Fatores relacionados:

- Idade do animal
- tamanho corporal
- Taxa de crescimento
- Estágio de gestação
- Atividade muscular
- Meio ambiente –
  - Temperatura, umidade, intensidade solar, etc.



# Materiais e Métodos



Estrela da serra





# Materiais e Métodos

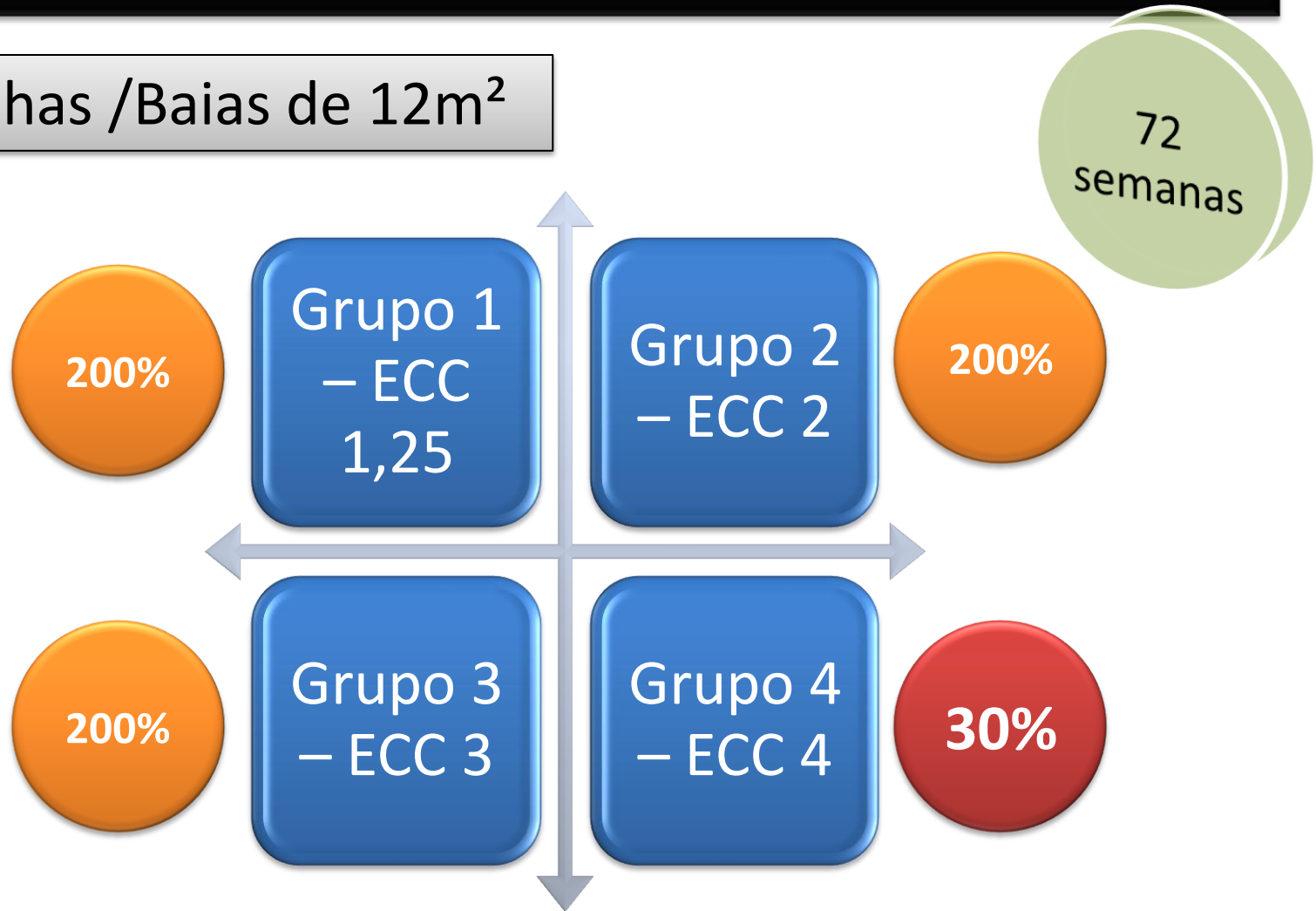
- Dieta: 2 semanas de estabilização

Tabela 1: Valores nutritivos dos alimentos da dieta das ovelhas alimentadas durante o experimento.

	Silagem de milho	glúten de milho	Dieta
Materia Seca (%)	26,5	88	45,4
Proteína bruta (% MS)	8,6	20	12,1
Energia metabolizavel (MJ/kg MS)	9	13	10,2
FDN (% MS)	55,3	35,3	49,1
FDA (% MS)	32,8	10,6	25,9
N:MJ (gN/MJ EM)	1,5	2,5	1,9
RDP/MJ (gRDP/MJ EM)	6,2	10,8	8

# Desenho experimental

5 ovelhas /Baías de 12m<sup>2</sup>



# Coletas

- Análises sangüíneas:
  - 3 alíquotas por coleta
  - Armazenado a  $-20^{\circ}\text{C}$



# Coletas

- Análises sanguíneas:

- STATUS ENERGÉTICO -

GLICOSE

INSULINA

GLUCAGON

ACIDOS GRAXOS NÃO ESTERIFICADOS

BETA HIDROXIBUTIRATO

TRIGLICERIDEOS

LIPIDIOS TOTAIS

- STATUS PROTÉICO -

ALBUMINA

GLOBULINAS

PROTEINA TOTAL

URÉIA

CREATININA

- HORMONIOS -

TRIIODOTIRONINA

TIROXINA

IGF-1



# Resultados e Discussão

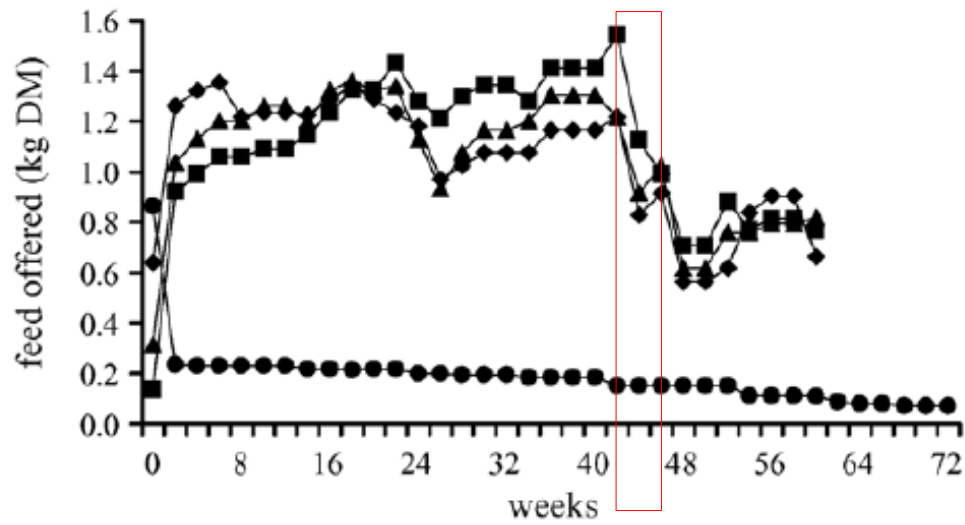


Fig. 1. Amount of feed offered to four groups of ewes in an increasing ((◆) Group 1, (■) Group 2 and (▲) Group 3) or decreasing body condition ((●) Group 4).

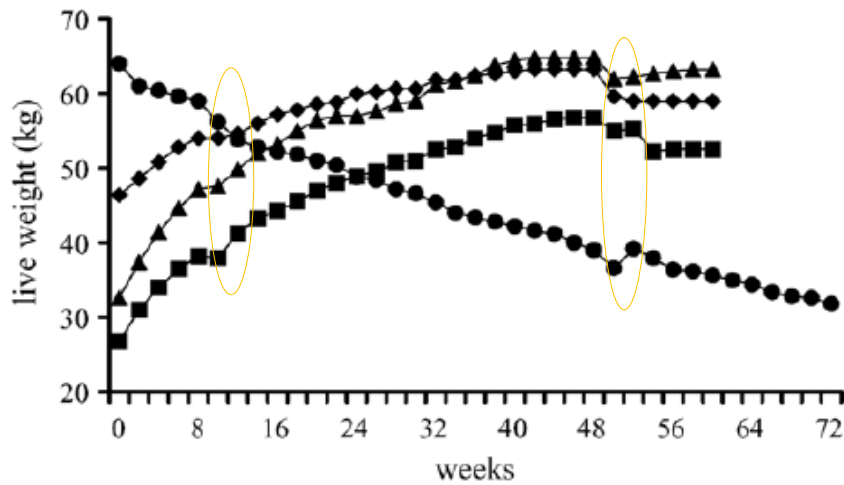


Fig. 3. Mean live weight in four groups of ewes in an increasing ((◆) Group 1, (■) Group 2 and (▲) Group 3) or decreasing body condition ((●) Group 4).

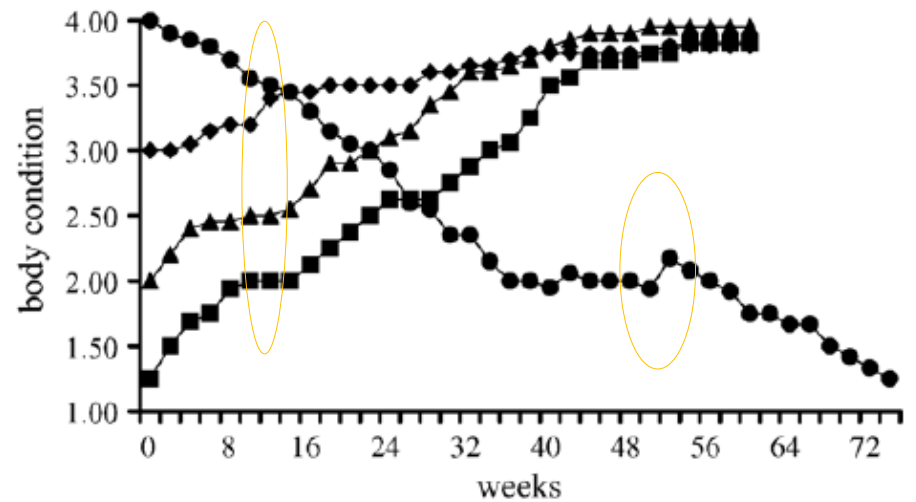


Fig. 2. Mean BCS in four groups of ewes in an increasing ((◆) Group 1, (■) Group 2 and (▲) Group 3) or decreasing body condition ((●) Group 4).

Table 2

Mean ( $\pm$ S.E.) plasma glucose and glucagon and serum insulin concentrations in ewes with different scores of increasing (Groups 1–3  $\rightarrow$ ) and decreasing (Group 4  $\leftarrow$ ) body condition

	Body condition score						
	1.25	1.5	2	2.5	3	3.5	4
Plasma glucose (mmol/l)							
Group 1 $\rightarrow$	2.95 $\pm$ 0.05 <sup>Bcd</sup>	3.11 $\pm$ 0.08 <sup>Bbc</sup>	2.58 $\pm$ 0.07 <sup>Bd</sup>	3.57 $\pm$ 0.13 <sup>Bab</sup>	3.43 $\pm$ 0.18 <sup>Babc</sup>	3.52 $\pm$ 0.11 <sup>ABabc</sup>	3.74 $\pm$ 0.41 <sup>Ba</sup>
Group 2 $\rightarrow$			3.02 $\pm$ 0.10 <sup>Bbc</sup>	2.75 $\pm$ 0.10 <sup>Cc</sup>	3.54 $\pm$ 0.09 <sup>Bab</sup>	3.70 $\pm$ 0.09 <sup>Aa</sup>	3.58 $\pm$ 0.25 <sup>Ba</sup>
Group 3 $\rightarrow$					3.28 $\pm$ 0.18 <sup>Bb</sup>	2.69 $\pm$ 0.09 <sup>Cc</sup>	4.74 $\pm$ 0.58 <sup>Aa</sup>
Group 4 $\leftarrow$	3.34 $\pm$ 0.33 <sup>Abcd</sup>	3.51 $\pm$ 0.16 <sup>Aabc</sup>	4.01 $\pm$ 0.41 <sup>Aab</sup>	4.32 $\pm$ 0.35 <sup>Aa</sup>	4.37 $\pm$ 0.35 <sup>Aa</sup>	3.15 $\pm$ 0.12 <sup>BCd</sup>	3.29 $\pm$ 0.11 <sup>Bcd</sup>
Serum insulin ( $\mu$ U/ml)							
Group 1 $\rightarrow$	4.38 $\pm$ 0.80 <sup>Ab</sup>	4.52 $\pm$ 0.48 <sup>Ab</sup>	13.07 $\pm$ 1.69 <sup>Aa</sup>	24.75 $\pm$ 7.87 <sup>Aa</sup>	24.88 $\pm$ 5.63 <sup>Aa</sup>	19.72 $\pm$ 4.41 <sup>Aa</sup>	15.78 $\pm$ 5.22 <sup>BCa</sup>
Group 2 $\rightarrow$			4.51 $\pm$ 0.83 <sup>Bb</sup>	20.53 $\pm$ 5.01 <sup>Aa</sup>	29.42 $\pm$ 7.69 <sup>Aa</sup>	28.18 $\pm$ 6.42 <sup>Aa</sup>	19.24 $\pm$ 6.22 <sup>ABa</sup>
Group 3 $\rightarrow$					10.52 $\pm$ 2.65 <sup>Bb</sup>	25.87 $\pm$ 2.68 <sup>Aa</sup>	6.18 $\pm$ 1.38 <sup>Cb</sup>
Group 4 $\leftarrow$	3.82 $\pm$ 0.43 <sup>Ad</sup>	4.39 $\pm$ 0.47 <sup>AcD</sup>	5.78 $\pm$ 0.58 <sup>Bbcd</sup>	6.22 $\pm$ 1.33 <sup>Bbcd</sup>	8.46 $\pm$ 2.96 <sup>Bbc</sup>	9.86 $\pm$ 2.87 <sup>Bb</sup>	27.86 $\pm$ 4.81 <sup>Aa</sup>
Plasma glucagon (pg/ml)							
Group 1 $\rightarrow$	71.85 $\pm$ 16.87 <sup>Aa</sup>	69.58 $\pm$ 11.25 <sup>Aa</sup>	76.39 $\pm$ 5.92 <sup>Aa</sup>	38.34 $\pm$ 3.02 <sup>Ba</sup>	79.31 $\pm$ 1.35 <sup>ABa</sup>	58.51 $\pm$ 3.10 <sup>Aa</sup>	76.19 $\pm$ 19.88 <sup>Ba</sup>
Group 2 $\rightarrow$			78.17 $\pm$ 3.19 <sup>Aa</sup>	85.05 $\pm$ 8.78 <sup>ABa</sup>	57.60 $\pm$ 10.44 <sup>Ba</sup>	84.51 $\pm$ 8.19 <sup>Aa</sup>	53.23 $\pm$ 14.55 <sup>Ba</sup>
Group 3 $\rightarrow$					101.5 $\pm$ 8.19 <sup>Aa</sup>	93.80 $\pm$ 12.42 <sup>Aa</sup>	43.28 $\pm$ 1.75 <sup>Bb</sup>
Group 4 $\leftarrow$	79.43 $\pm$ 11.44 <sup>Ab</sup>	70.43 $\pm$ 15.75 <sup>Abc</sup>	28.08 $\pm$ 10.57 <sup>Bc</sup>	96.80 $\pm$ 19.77 <sup>Ab</sup>	119.8 $\pm$ 52.8 <sup>Ab</sup>	98.21 $\pm$ 4.27 <sup>Ab</sup>	189.3 $\pm$ 21.6 <sup>Aa</sup>

Within a variable, means within a column with different superscripts (A–C) differ significantly ( $P < 0.05$ ). Within a variable, means within a row with different superscripts (a–d) differ significantly ( $P < 0.05$ ). Values of glucose concentrations are means of two observations in each ewe, at 09:00 h on day 1 and at 16:00 h on day 3.

# Glicose

Grupos ↑ ECC:

Mudanças insignificantes ou um aumento gradual (grupo 3)

Grupo 4:

- Estável até 3,5
- Maiores níveis entre 3 e 2
- Queda dos níveis 1,5 e 1,25



# Insulina

Grupos ↑ ECC:

Aumentou  
(3,8 – 5,8)

Estabilizou  
(20 - 28)

“Queda”  
(14-19)

Grupo 4:

- Queda rápida entre 4 e 3,5
- Manteve queda dos níveis até 1,25

# Glucagon

Grupos 1 e 2:  
Sem variações significantes

Grupo 3:  
- Diminuiu ao ECC 4;

Grupo 4:  
- Diminuiu, porém;  
-Alto ao ECC 3,5 a 2,5 comparado aos outros  
-Diminuiu com ECC 2  
-Aumentou nos níveis mais baixos

**Mobilização de reservas corporais e manutenção**

Table 3

Mean ( $\pm$ S.E.) serum non-esterified fatty acids,  $\beta$ -hydroxybutyrate and triglycerides concentrations in ewes with different scores of increasing (Groups 1–3  $\rightarrow$ ) and decreasing (Group 4  $\leftarrow$ ) body condition

	Body condition score						
	1.25	1.5	2	2.5	3	3.5	4
Serum non-esterified fatty acids ( $\mu\text{mol/l}$ )							
Group 1 $\rightarrow$	666.9 $\pm$ 52.1 <sup>Aa</sup>	174.4 $\pm$ 41.0 <sup>Bb</sup>	144.2 $\pm$ 16.5 <sup>Bb</sup>	218.0 $\pm$ 39.7 <sup>Bb</sup>	228.6 $\pm$ 43.0 <sup>Bb</sup>	281.9 $\pm$ 41.1 <sup>BCb</sup>	610.8 $\pm$ 181.0 <sup>Aa</sup>
Group 2 $\rightarrow$			789.9 $\pm$ 62.2 <sup>Aa</sup>	132.1 $\pm$ 28.3 <sup>Bd</sup>	214.2 $\pm$ 13.7 <sup>Bcd</sup>	348.4 $\pm$ 36.2 <sup>Bc</sup>	597.9 $\pm$ 88.9 <sup>Ab</sup>
Group 3 $\rightarrow$					686.3 $\pm$ 81.4 <sup>Aa</sup>	170.9 $\pm$ 30.6 <sup>Cb</sup>	671.6 $\pm$ 95.8 <sup>Aa</sup>
Group 4 $\leftarrow$	593.5 $\pm$ 125.8 <sup>Abc</sup>	848.4 $\pm$ 127.0 <sup>Aa</sup>	749.8 $\pm$ 65.7 <sup>Aab</sup>	603.7 $\pm$ 57.6 <sup>Abc</sup>	760.6 $\pm$ 57.3 <sup>Aab</sup>	546.5 $\pm$ 76.3 <sup>Ac</sup>	326.6 $\pm$ 29.9 <sup>Bd</sup>
Serum $\beta$ -hydroxybutyrate (mmol/l)							
Group 1 $\rightarrow$	0.443 $\pm$ 0.031 <sup>Ad</sup>	0.372 $\pm$ 0.012 <sup>Bde</sup>	0.320 $\pm$ 0.024 <sup>Be</sup>	0.870 $\pm$ 0.068 <sup>Aa</sup>	0.769 $\pm$ 0.102 <sup>Bb</sup>	0.663 $\pm$ 0.051 <sup>Bb</sup>	0.538 $\pm$ 0.044 <sup>Ac</sup>
Group 2 $\rightarrow$			0.454 $\pm$ 0.022 <sup>Abc</sup>	0.381 $\pm$ 0.023 <sup>Cc</sup>	0.852 $\pm$ 0.038 <sup>Aa</sup>	0.765 $\pm$ 0.033 <sup>Aa</sup>	0.469 $\pm$ 0.032 <sup>Ab</sup>
Group 3 $\rightarrow$					0.416 $\pm$ 0.022 <sup>Cab</sup>	0.350 $\pm$ 0.015 <sup>Cb</sup>	0.488 $\pm$ 0.036 <sup>Aa</sup>
Group 4 $\leftarrow$	0.406 $\pm$ 0.033 <sup>Ac</sup>	0.439 $\pm$ 0.028 <sup>Abc</sup>	0.473 $\pm$ 0.017 <sup>Abc</sup>	0.626 $\pm$ 0.018 <sup>Ba</sup>	0.707 $\pm$ 0.028 <sup>Ba</sup>	0.295 $\pm$ 0.020 <sup>Cd</sup>	0.513 $\pm$ 0.039 <sup>Ab</sup>
Serum triglycerides (mmol/l)							
Group 1 $\rightarrow$	0.145 $\pm$ 0.019 <sup>Aab</sup>	0.099 $\pm$ 0.007 <sup>Bc</sup>	0.095 $\pm$ 0.010 <sup>Bc</sup>	0.108 $\pm$ 0.011 <sup>Bc</sup>	0.119 $\pm$ 0.015 <sup>Bbc</sup>	0.156 $\pm$ 0.015 <sup>Aab</sup>	0.174 $\pm$ 0.020 <sup>Aa</sup>
Group 2 $\rightarrow$			0.115 $\pm$ 0.012 <sup>Bb</sup>	0.102 $\pm$ 0.009 <sup>Bb</sup>	0.163 $\pm$ 0.013 <sup>Aa</sup>	0.150 $\pm$ 0.015 <sup>Aa</sup>	0.133 $\pm$ 0.010 <sup>Bab</sup>
Group 3 $\rightarrow$					0.138 $\pm$ 0.011 <sup>ABa</sup>	0.155 $\pm$ 0.015 <sup>Aa</sup>	0.165 $\pm$ 0.014 <sup>Aa</sup>
Group 4 $\leftarrow$	0.167 $\pm$ 0.015 <sup>Aa</sup>	0.200 $\pm$ 0.026 <sup>Aa</sup>	0.155 $\pm$ 0.012 <sup>Aa</sup>	0.156 $\pm$ 0.014 <sup>Aa</sup>	0.120 $\pm$ 0.008 <sup>Bb</sup>	0.175 $\pm$ 0.012 <sup>Aa</sup>	0.199 $\pm$ 0.015 <sup>Aa</sup>

Within a variable, means within a column with different superscripts (A–C) differ significantly ( $P < 0.05$ ). Within a variable, means within a row with different superscripts (a–e) differ significantly ( $P < 0.05$ ). Values are means of two observations in each ewe, at 09:00 h on day 1 and at 16:00 h on day 3.

# NEFA

## Grupo 1 -3:

- Mudanças similares
- Diminui ao início da sobre-nutrição
- Se mantém baixo em níveis intermediários
- Aumenta nos níveis altos de ECC.

## Grupo 4:

- Aumentos ao início da restrição alimentar
- estabilizou entre 3 e 1,5
- **Diminuiu entre 1, 5 e 1,25 ???**



Table 4

Mean ( $\pm$ S.E.) serum total lipids, albumin and globulins concentrations in ewes with different scores of increasing (Groups 1–3  $\rightarrow$ ) and decreasing (Group 4  $\leftarrow$ ) body condition

	Body condition score						
	1.25	1.5	2	2.5	3	3.5	4
<b>Serum total lipids (g/l)</b>							
Group 1 $\rightarrow$	2.03 $\pm$ 0.19 <sup>Bc</sup>	2.05 $\pm$ 0.07 <sup>Bc</sup>	2.56 $\pm$ 0.13 <sup>Ab</sup>	3.01 $\pm$ 0.20 <sup>Aa</sup>	2.26 $\pm$ 0.15 <sup>Bc</sup>	2.30 $\pm$ 0.12 <sup>Abc</sup>	3.00 $\pm$ 0.13 <sup>Aa</sup>
Group 2 $\rightarrow$			1.93 $\pm$ 0.15 <sup>Bc</sup>	2.58 $\pm$ 0.14 <sup>Bab</sup>	2.77 $\pm$ 0.11 <sup>Aa</sup>	2.14 $\pm$ 0.09 <sup>Ac</sup>	2.50 $\pm$ 0.15 <sup>Bb</sup>
Group 3 $\rightarrow$					1.68 $\pm$ 0.11 <sup>Cc</sup>	2.20 $\pm$ 0.09 <sup>Ab</sup>	2.72 $\pm$ 0.21 <sup>Ba</sup>
Group 4 $\leftarrow$	3.11 $\pm$ 0.24 <sup>Aa</sup>	2.85 $\pm$ 0.11 <sup>Aab</sup>	2.11 $\pm$ 0.12 <sup>Bc</sup>	2.66 $\pm$ 0.14 <sup>ABb</sup>	2.77 $\pm$ 0.22 <sup>Ab</sup>	2.09 $\pm$ 0.10 <sup>Ac</sup>	1.73 $\pm$ 0.11 <sup>Cd</sup>
<b>Serum albumin (g/l)</b>							
Group 1 $\rightarrow$	26.25 $\pm$ 0.81 <sup>Ac</sup>	23.87 $\pm$ 0.34 <sup>Bd</sup>	31.17 $\pm$ 0.72 <sup>Ab</sup>	37.00 $\pm$ 0.56 <sup>Aa</sup>	36.60 $\pm$ 0.67 <sup>Aa</sup>	37.54 $\pm$ 0.71 <sup>ABa</sup>	34.10 $\pm$ 2.09 <sup>Bb</sup>
Group 2 $\rightarrow$			29.93 $\pm$ 0.67 <sup>Ac</sup>	32.57 $\pm$ 0.51 <sup>Bb</sup>	37.86 $\pm$ 0.76 <sup>Aa</sup>	38.25 $\pm$ 0.77 <sup>Aa</sup>	37.55 $\pm$ 0.88 <sup>Aa</sup>
Group 3 $\rightarrow$					31.68 $\pm$ 1.09 <sup>Bb</sup>	35.53 $\pm$ 0.89 <sup>Ba</sup>	34.68 $\pm$ 1.80 <sup>Ba</sup>
Group 4 $\leftarrow$	29.72 $\pm$ 0.97 <sup>Ae</sup>	35.29 $\pm$ 1.68 <sup>Aab</sup>	31.30 $\pm$ 1.96 <sup>AcD</sup>	29.95 $\pm$ 1.12 <sup>Cde</sup>	31.23 $\pm$ 1.51 <sup>Bcd</sup>	32.15 $\pm$ 1.89 <sup>Cbc</sup>	35.39 $\pm$ 1.12 <sup>Ba</sup>
<b>Serum globulins (g/l)</b>							
Group 1 $\rightarrow$	35.64 $\pm$ 0.26 <sup>Abc</sup>	32.77 $\pm$ 1.07 <sup>Ac</sup>	35.89 $\pm$ 1.34 <sup>Bbc</sup>	39.52 $\pm$ 2.53 <sup>Ab</sup>	39.48 $\pm$ 0.65 <sup>Ab</sup>	37.55 $\pm$ 0.97 <sup>Ab</sup>	46.78 $\pm$ 3.41 <sup>Aa</sup>
Group 2 $\rightarrow$			34.50 $\pm$ 1.60 <sup>Ba</sup>	33.59 $\pm$ 1.71 <sup>Ba</sup>	36.81 $\pm$ 2.23 <sup>Aa</sup>	33.84 $\pm$ 1.71 <sup>Aa</sup>	37.77 $\pm$ 2.28 <sup>Ca</sup>
Group 3 $\rightarrow$					40.50 $\pm$ 2.94 <sup>Aab</sup>	38.28 $\pm$ 1.94 <sup>Ab</sup>	46.07 $\pm$ 4.37 <sup>ABa</sup>
Group 4 $\leftarrow$	35.64 $\pm$ 1.94 <sup>Aa</sup>	36.54 $\pm$ 2.45 <sup>Aa</sup>	42.42 $\pm$ 3.67 <sup>Aa</sup>	41.69 $\pm$ 1.83 <sup>Aa</sup>	41.51 $\pm$ 2.22 <sup>Aa</sup>	38.28 $\pm$ 1.94 <sup>Aa</sup>	41.07 $\pm$ 1.47 <sup>BCa</sup>

Within a variable, means within a column with different superscripts (A–C) differ significantly ( $P < 0.05$ ). Within a variable, means within a row with different superscripts (a–e) differ significantly ( $P < 0.05$ ). Values of total lipids concentrations are means of two observations in each ewe, at 09:00 h on day 1 and at 16:00 h on day 3.

# ALBUMINA

- Grupos 1 -3:
  - Aumentos similares em níveis intermediários com leve estabilização.
- Grupo 4:
  - Queda gradual até o ECC 2,5
  - Estabilizou ao ECC 2
  - **AUMENTOU AO ECC 1,5...**

Table 5

Mean ( $\pm$ S.E.) serum total protein, urea and creatinine concentrations in ewes with different scores of increasing (Groups 1–3  $\rightarrow$ ) and decreasing (Group 4  $\leftarrow$ ) body condition

	Body condition score						
	1.25	1.5	2	2.5	3	3.5	4
Serum total protein (g/l)							
Group 1 $\rightarrow$	61.89 $\pm$ 0.86 <sup>Ad</sup>	56.64 $\pm$ 0.85 <sup>Be</sup>	67.06 $\pm$ 0.66 <sup>Bc</sup>	76.52 $\pm$ 2.90 <sup>Aab</sup>	76.08 $\pm$ 1.08 <sup>Aab</sup>	75.09 $\pm$ 0.30 <sup>Ab</sup>	80.88 $\pm$ 1.38 <sup>Aa</sup>
Group 2 $\rightarrow$			64.43 $\pm$ 1.45 <sup>Bb</sup>	66.16 $\pm$ 1.42 <sup>Cb</sup>	74.67 $\pm$ 2.31 <sup>Aa</sup>	72.09 $\pm$ 2.20 <sup>Aa</sup>	75.32 $\pm$ 1.82 <sup>Ba</sup>
Group 3 $\rightarrow$					72.18 $\pm$ 2.77 <sup>Ab</sup>	70.43 $\pm$ 2.49 <sup>Ab</sup>	80.75 $\pm$ 4.44 <sup>Aa</sup>
Group 4 $\leftarrow$	65.37 $\pm$ 1.08 <sup>Ac</sup>	71.83 $\pm$ 1.82 <sup>Aab</sup>	73.72 $\pm$ 2.08 <sup>Aab</sup>	71.65 $\pm$ 0.80 <sup>Bb</sup>	72.74 $\pm$ 2.23 <sup>Aab</sup>	70.43 $\pm$ 2.49 <sup>Abc</sup>	76.46 $\pm$ 1.66 <sup>ABa</sup>
Serum urea (mmol/l)							
Group 1 $\rightarrow$	5.20 $\pm$ 0.24 <sup>Aa</sup>	3.80 $\pm$ 0.33 <sup>Bb</sup>	5.91 $\pm$ 0.71 <sup>Aa</sup>	3.89 $\pm$ 0.50 <sup>Bb</sup>	5.81 $\pm$ 0.39 <sup>Aa</sup>	5.52 $\pm$ 0.38 <sup>ABa</sup>	5.22 $\pm$ 0.35 <sup>ABa</sup>
Group 2 $\rightarrow$			4.52 $\pm$ 0.32 <sup>Bcd</sup>	6.29 $\pm$ 0.92 <sup>Aab</sup>	4.20 $\pm$ 0.46 <sup>Bd</sup>	6.53 $\pm$ 0.84 <sup>Aa</sup>	5.14 $\pm$ 0.61 <sup>Bbc</sup>
Group 3 $\rightarrow$					4.46 $\pm$ 0.33 <sup>Bb</sup>	4.85 $\pm$ 0.27 <sup>ab</sup>	5.62 $\pm$ 0.58 <sup>ABa</sup>
Group 4 $\leftarrow$	5.93 $\pm$ 0.42 <sup>Aa</sup>	5.89 $\pm$ 0.48 <sup>Aa</sup>	5.27 $\pm$ 0.46 <sup>ABab</sup>	5.87 $\pm$ 0.37 <sup>Aa</sup>	4.73 $\pm$ 0.28 <sup>ABb</sup>	5.59 $\pm$ 0.50 <sup>ABab</sup>	5.97 $\pm$ 0.26 <sup>Aa</sup>
Serum creatinine ( $\mu$ mol/l)							
Group 1 $\rightarrow$	93.2 $\pm$ 4.20 <sup>Abc</sup>	76.5 $\pm$ 4.54 <sup>Ac</sup>	96.3 $\pm$ 4.78 <sup>Bb</sup>	86.0 $\pm$ 4.26 <sup>Bbc</sup>	94.0 $\pm$ 4.67 <sup>Bbc</sup>	93.1 $\pm$ 2.22 <sup>Bbc</sup>	111.6 $\pm$ 2.62 <sup>BCa</sup>
Group 2 $\rightarrow$			106.9 $\pm$ 4.08 <sup>Ab</sup>	102.7 $\pm$ 1.84 <sup>Ab</sup>	97.6 $\pm$ 5.08 <sup>ABb</sup>	104.3 $\pm$ 5.44 <sup>Ab</sup>	129.2 $\pm$ 9.28 <sup>Aa</sup>
Group 3 $\rightarrow$					87.0 $\pm$ 6.33 <sup>Bb</sup>	92.1 $\pm$ 3.96 <sup>Bb</sup>	115.7 $\pm$ 4.50 <sup>Ba</sup>
Group 4 $\leftarrow$	89.0 $\pm$ 8.00 <sup>AcD</sup>	82.0 $\pm$ 5.22 <sup>Ad</sup>	100.7 $\pm$ 7.79 <sup>ABabc</sup>	96.2 $\pm$ 8.47 <sup>Abcd</sup>	107.1 $\pm$ 8.18 <sup>Aab</sup>	107.9 $\pm$ 8.19 <sup>Aa</sup>	101.8 $\pm$ 2.87 <sup>Cabc</sup>

Within a variable, means within a column with different superscripts (A–C) differ significantly ( $P < 0.05$ ). Within a variable, means within a row with different superscripts (a–e) differ significantly ( $P < 0.05$ ). Values of urea concentrations are means of two observations in each ewe, at 09:00 h on day 1 and at 16:00 h on day 3.

# URÉIA

Flutuou em todos os grupos..

Grupos 1-3:

- maior ingestão de N

Table 6

Mean ( $\pm$ S.E.) plasma triiodothyronine and thyroxine and serum insulin-like growth factor-I concentrations in ewes with different scores of increasing (Groups 1–3  $\rightarrow$ ) and decreasing (Group 4  $\leftarrow$ ) body condition

	Body condition score						
	1.25	1.5	2	2.5	3	3.5	4
Plasma triiodothyronine (ng/ml)							
Group 1 $\rightarrow$	0.773 $\pm$ 0.055 <sup>Ac</sup>	0.737 $\pm$ 0.117 <sup>Ac</sup>	1.093 $\pm$ 0.157 <sup>Ab</sup>	1.040 $\pm$ 0.220 <sup>Abc</sup>	1.527 $\pm$ 0.168 <sup>Aa</sup>	1.618 $\pm$ 0.165 <sup>Aa</sup>	1.059 $\pm$ 0.155 <sup>Abc</sup>
Group 2 $\rightarrow$			1.048 $\pm$ 0.074 <sup>ABb</sup>	1.015 $\pm$ 0.093 <sup>Ab</sup>	1.461 $\pm$ 0.173 <sup>Aa</sup>	1.536 $\pm$ 0.217 <sup>Aa</sup>	1.221 $\pm$ 0.094 <sup>Aab</sup>
Group 3 $\rightarrow$					1.383 $\pm$ 0.176 <sup>Aa</sup>	1.147 $\pm$ 0.177 <sup>Bab</sup>	0.965 $\pm$ 0.313 <sup>Ab</sup>
Group 4 $\leftarrow$	0.129 $\pm$ 0.034 <sup>Bd</sup>	0.920 $\pm$ 0.211 <sup>Aab</sup>	0.773 $\pm$ 0.135 <sup>Bbc</sup>	0.533 $\pm$ 0.037 <sup>Bc</sup>	0.781 $\pm$ 0.091 <sup>Babc</sup>	1.084 $\pm$ 0.120 <sup>Ba</sup>	1.025 $\pm$ 0.089 <sup>Aab</sup>
Plasma thyroxine (ng/ml)							
Group 1 $\rightarrow$	41.67 $\pm$ 4.66 <sup>Ab</sup>	44.46 $\pm$ 5.12 <sup>Ab</sup>	46.13 $\pm$ 5.81 <sup>ABb</sup>	69.42 $\pm$ 4.40 <sup>Aa</sup>	50.01 $\pm$ 2.83 <sup>Cb</sup>	55.47 $\pm$ 3.14 <sup>Ab</sup>	23.17 $\pm$ 1.71 <sup>Cc</sup>
Group 2 $\rightarrow$			52.71 $\pm$ 4.45 <sup>Abc</sup>	42.22 $\pm$ 3.08 <sup>Bcd</sup>	75.79 $\pm$ 2.29 <sup>Aa</sup>	56.99 $\pm$ 8.66 <sup>Ab</sup>	34.75 $\pm$ 8.61 <sup>Bd</sup>
Group 3 $\rightarrow$					63.23 $\pm$ 8.45 <sup>Ba</sup>	63.73 $\pm$ 5.50 <sup>Aa</sup>	18.22 $\pm$ 1.71 <sup>Cb</sup>
Group 4 $\leftarrow$	22.65 $\pm$ 0.82 <sup>Bc</sup>	43.72 $\pm$ 5.98 <sup>Aab</sup>	33.35 $\pm$ 3.61 <sup>Bbc</sup>	35.35 $\pm$ 6.56 <sup>Bbc</sup>	42.26 $\pm$ 3.98 <sup>Cub</sup>	36.67 $\pm$ 5.04 <sup>Bb</sup>	52.06 $\pm$ 3.06 <sup>Aa</sup>
Serum insulin-like growth factor-I (ng/ml)							
Group 1 $\rightarrow$	64.8 $\pm$ 23.9 <sup>Ad</sup>	141.0 $\pm$ 51.9 <sup>Bd</sup>	149.3 $\pm$ 34.9 <sup>Bd</sup>	295.8 $\pm$ 49.0 <sup>Ac</sup>	464.9 $\pm$ 59.4 <sup>Aab</sup>	368.7 $\pm$ 34.0 <sup>Bbc</sup>	591.5 $\pm$ 80.7 <sup>Aa</sup>
Group 2 $\rightarrow$			156.8 $\pm$ 51.3 <sup>Bb</sup>	191.6 $\pm$ 28.7 <sup>ABb</sup>	234.6 $\pm$ 9.1 <sup>Bb</sup>	471.2 $\pm$ 85.72 <sup>Aa</sup>	563.9 $\pm$ 73.5 <sup>Aa</sup>
Group 3 $\rightarrow$					166.2 $\pm$ 41.4 <sup>Bc</sup>	325.0 $\pm$ 26.23 <sup>BCb</sup>	614.4 $\pm$ 128.2 <sup>Aa</sup>
Group 4 $\leftarrow$	85.5 $\pm$ 44.9 <sup>Ad</sup>	396.4 $\pm$ 89.3 <sup>Aa</sup>	324.3 $\pm$ 35.4 <sup>Aab</sup>	145.8 $\pm$ 13.8 <sup>Bcd</sup>	196.2 $\pm$ 23.4 <sup>Bc</sup>	226.2 $\pm$ 18.4 <sup>Cbc</sup>	242.1 $\pm$ 17.7 <sup>Bbc</sup>

Within a variable, means within a column with different superscripts (A–C) differ significantly ( $P < 0.05$ ). Within a variable, means within a row with different superscripts (a–d) differ significantly ( $P < 0.05$ ).

# Triiodotironina

- Grupo 1 e 2:
  - aumento gradual até 3,5
  - Diminuiu ao ECC 4
- Grupo 3:
  - Diminuiu ao ECC 4
- Grupo 4:
  - Variações entre os níveis de ECC
  - Queda brusca ECC 1,25





# Conclusão

Ovelhas entre ECC 2 e 3,5 conseguem manter suas reservas corporais, sendo observado um melhor bem-estar dos animais entre 2,5 e 3.

Ovelhas abaixo de 1,5 e acima de 3,5 apresentam distúrbios metabólicos e um excessivo custo de manutenção

Muito Obrigado

