Effect of maternal undernutrition on the hypothalamic-pituitary-gonadal axis function in sheep offspring

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Introduction
The fetal programming hypothesis demonstrates that a stimulus or insult during sensitive periods of early life can lead to permanent alterations in fetus organ structure, physiology and metabolism. Nutrition as early as in embryonic life can have profound effects on the reproductive system of the fetus that could affect the reproductive potential later in adulthood.

Materials and Methods
22 pregnant Chios ewes (ABW= 63.0±0.6 Kg) were allocated to 3 treatments: Control (C), R1 and R2 (Fig. 1). 22 pregnant Chios ewes (ABW= 63.0±0.6 Kg) were allocated to 3 treatments: Control (C), R1 and R2 (Fig. 1)

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Aim of the study
To examine the effects of maternal nutrient restriction imposed during different periods of gestation on the hypothalamic-pituitary-gonadal axis function in sheep offspring at different ages postnatal.

Results

Table 1. Medians (and quartile range) of follicles and corpora lutea recorded from female offspring’s ovaries in total and according to their diameter.

<table>
<thead>
<tr>
<th>Group</th>
<th>Medians</th>
<th>Quartiles</th>
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<tbody>
<tr>
<td>C</td>
<td>2.0 (1.0)</td>
<td>1.0 (0.0)</td>
</tr>
<tr>
<td>R1</td>
<td>2.0 (1.0)</td>
<td>1.0 (0.0)</td>
</tr>
<tr>
<td>R2</td>
<td>2.0 (1.0)</td>
<td>1.0 (0.0)</td>
</tr>
</tbody>
</table>

No effect of maternal undernutrition on the:

- Weight at birth and subsequent growth
- Age of onset of endocrine puberty
- Preovulatory rise and the time to rise of both gonadotrophins of female offspring

FSH response at 10 months of age (Fig. 2) did not differ at each sampling time. However the area under the response curve (AUC) was higher in R1 group accompanied by a higher number of small follicles (Table 1).

R2 group showed a lower number of corpora lutea (Table 1).

Conclusions
Female offspring
- Early in gestation resulted in a higher pituitary response to GnRH challenge along with an increased accumulation of small follicles (2-3 mm) in the ovaries
- In mid gestation resulted in a significantly lower number of large (>8 mm) corpora lutea in the ovaries
- Did not affect the age of onset of puberty
- Did not affect preovulatory gonadotrophins profiles

Maternal undernutrition

No effect of maternal undernutrition on the body weight of male and female offspring

Male offspring
- In mid gestation resulted in increased pituitary response accompanied by a lower Sertoli cell count and smaller tubule diameter in tests (Table 2 and Image 1)