

## **Influence of amniotic fluid composition on fetal homeostasis in an experimental lamb model**

Moran M, Illa M, Handel-Mazzeti H, López M, Villaronga M, Fucho R, Hawkins-Villarreal A, Randanne P, Bobillo S, Velilla M, Del Rio R, Sanin-Ramirez D, Chorda M, De Roo Y, Bonet E, Gratacos E, Eixarch E

Hospital Clinic de Barcelona - Hospital Sant Joan de Deu, Barcelona, Spain

### **Objective**

To explore the impact on ionic and acid-basic fetal homeostasis in an experimental model of artificial placenta (AP) system according to amniotic fluid composition.

### **Methods**

Fourteen fetal lambs were transferred to an AP system at  $113 \pm 4$  days with umbilical cord cannulation of two arteries and one vein, connected to a pumpless extracorporeal circuit with low resistance oxygenator. 7 of these fetuses were maintained in a physiologic solution (Group 1), whereas 7 animals were maintained in a synthetic amniotic fluid environment (Group 2). As a synthetic environment, a commercial synthetic amniotic fluid, Amnion Flush Solution® (Serumwerk Bernburg AG), or in-house homemade liquid (both with similar composition) were indistinctively used. All the animals were maintained in the AP system at least 24 hours (range 24h –168h). Medical support was applied following a standard protocol aiming to maintained fetal status within physiological ranges (pH 7.35-7.45, HCO<sub>3</sub> 23-29 mmol/L, Na 130-145 mmol/L, Cl 97-113 mmol/L, Ca 1.3-1.9 mmol/L). Circuit blood flow, fetal heart rate, pre-membrane saturation, and pre-/post-membrane pressure were continuously recorded. Pre-membrane blood samples were obtained at least every 3 hours for blood gas and electrolyte using EPOC® system.

### **Results**

Median survival length in the AP system were  $72.4 \pm 1.1$  hours, with no significant difference between groups (Group 1 vs Group 2:  $72.2 \pm 1.1$  h vs  $96.1 \pm 1.2$ ; n. s). No differences were observed in hemodynamics parameters between groups (blood flow:  $173.6 \pm 30.9$  vs  $136.2 \pm 43.8$  ml/kg/min; heart rate:  $180.4 \pm 38.9$  vs  $177 \pm 70.4$  bpm; and pre-membrane saturation:  $31.6 \pm 11.3$  vs  $34.1 \pm 11.5$  %, n. s). When comparing ionic and acid-base homeostasis, Group 2 presented a statistically significant better results in pH ( $7.34 \pm 0.7$  vs  $7.37 \pm 0.1$ ,  $p < 0.001$ ), HCO<sub>3</sub> ( $22.85 \pm 2.8$  vs  $23.93 \pm 2.5$  mmol/L,  $p < 0.001$ ), Na<sup>+</sup> ( $137.97 \pm 5.8$  vs  $142.98 \pm 6.5$  mmol/L,  $p < 0.001$ ), Cl<sup>-</sup> ( $102.97 \pm 5.7$  vs  $106.21 \pm 6.8$  mmol/L,  $p < 0.001$ ), and Ca<sup>2+</sup> ( $1.50 \pm 0.3$  vs  $1.39 \pm 0.1$  mmol/L,  $p < 0.001$ ). Finally, Group 2 required lower proportion of ionic corrections to be maintained in physiological ranges (27% vs 24%,  $p < 0.001$ ).

### **Conclusion**

Synthetic amniotic fluid resembling physiologic conditions is associated with better metabolic homeostasis in fetal lambs transferred to an AP system.