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11 AN ANIMAL MODEL TO INVESTIGATE CEREBRAL METABOLISM OF FETAL LAMBS IN UTERO DURING HYPOXIA BY NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY.

In this pilot study we developed a method to investigate the relation between fetal cerebral metabolism and arterial oxygen saturation (SaO2). Nuclear magnetic resonance spectroscopy (NMRS) of the fetal brain provided "in vivo" simultaneous sequential observations of cerebral metabolites in the same animal. Problems arising from measurements in a NMR setting like fitting the ewe in the bore hole, ventilatory support and fixation of the fetal head to avoid movement artefacts had to be solved.

Under general anaesthesia pregnant ewes of the Dutch Texel breed were operated between 120 and 128 days of gestation (term 147 days). The fetal head was delivered by hysterotomy and fixed. The axillary artery was cannulated for measurements of SaO2, pH and base excess (BE). A radiofrequency surface coil was located on the vertex of the fetal head to receive the NMR signal. The eue was ventilated by a system with 12m long tubing inside a 1.5T Siemens magnetic resonance system. After baseline measurements the fetal SaO2 was gradually reduced by lowering inspired oxygen of the eue.

The long tubing caused a delayed gas exchange. Fetal hypoxia (SaO2=10%) allowed a pH of 7.10 and BE of -15.0 to be achieved. The fetal body moved as a result of the maternal ventilation, but the fetal head stayed still. Cerebral spectra were obtained showing signals assigned to compounds such as inositol, choline, creatine, N-acetylaspartate and lactate.

NMRS of fetal lamb brain in utero during hypoxia is feasible and may serve as an animal model to investigate fetal cerebral metabolism in relation to SaO2 and other circulatory parameters.

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Introduction: The standard method for measuring gastric emptying of liquids during physical exercise is the invasive double sampling aspiration technique. Scintigraphy is not possible. The aim of the study was to compare a non-invasive breath test with the double sampling technique for the determination of gastric emptying of liquids during physical exercise.

Methods: After an overnight fast, 9 healthy well-trained male subjects were tested on two separate days using either 4.5% or 9.0% carbohydrate (CHO) and 50 mg [1-13C]-acetate (Ac) at Re, and 150 mg of Ac during Ex and 7.5 mg phenol red (Re+5%, Re9.0%, Ex+4.5% and Ex9.0%) was administered via a naso-gastric tube. Gastric aspirates and breath samples were collected at regular intervals. Gastric half emptying time (T1/2 GE) was determined from phenol red concentration in the gastric aspirates. 13C-enrichment of the breath samples was measured using Isotope Ratio Mass Spectrometry (Finnigan MAT 252). Time to peak 13C-enrichment (13C-TTP) was determined by fitting the data to an exponential function, and was regarded as the parameter of gastric emptying. VCO2 was continuously monitored by indirect calorimetry.

Results: Values are given in minutes (measurments). Correlations were calculated between 13C-TTP and Re9.0%, and are displayed in the table. Both tests showed that the 0.9% solutions emptied slower than the 4.5% solution. No difference in T1/2 GE was found between Ex and Re, but the 13C-TTP was reached significantly earlier during Ex than at Re for both solutions (p<0.05). During exercise the rate of metabolism and CO2 washout is increased. This explains the difference between Ex and Re. During both Ex and Re the VCO2 was constant in time.

<table>
<thead>
<tr>
<th>Ex9.0%</th>
<th>13C-TTP</th>
<th>corr. *</th>
<th>p (*significance level)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re+5%</td>
<td>150 mg Ac</td>
<td>16.5h</td>
<td>0.77</td>
</tr>
<tr>
<td>Re9.0%</td>
<td>50 mg Ac</td>
<td>15.7h</td>
<td>0.78</td>
</tr>
<tr>
<td>Ex+4.5%</td>
<td>150 mg Ac</td>
<td>14.5h</td>
<td>0.87</td>
</tr>
<tr>
<td>Ex+9.0%</td>
<td>150 mg Ac</td>
<td>21.9h</td>
<td>0.70</td>
</tr>
</tbody>
</table>

Conclusion: The 13C-acetate breath test can be used to determine the relative differences in the gastric emptying rate of liquids during physical exercise.