HAEMOGLOBIN IN CORD BLOOD IN NORMAL AND PROLONGED PREGNANCY

BY

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There have been few investigations on the haemoglobin level in foetal blood at different stages of human pregnancy. While studying the oxygen saturation in cord blood (Rooth and Sjöstedt, 1957), we also measured the amount of haemoglobin in some infants.

Material

Four hundred and fourteen healthy infants born in the Department of Obstetrics and Gynaecology were investigated. In no case was pregnancy complicated by toxaemia. All infants were delivered spontaneously without complications in occipito-anterior presentation and they showed no signs of asphyxia. In order to obtain reliable information on the duration of gestation, the dates on menstrual age were carefully checked. Only cases with a regular menstrual cycle were included and any in which the duration of pregnancy was in doubt were excluded.

Techniques

Immediately after delivery the cord was clamped in two places and blood extracted from the vein. The haemoglobin was determined as oxyhaemoglobin in a Beckman C photoelectric colorimeter with an interference filter (Bausch and Lomb) of 575 mμ. The blood was diluted one part in 240 parts of 0·01% Na₂CO₃ solution. To calculate the amount of haemoglobin, a millimolecular extinction of 15·35 was used (Drabkin, 1946). The molecular weight of haemoglobin was assumed to be 68·000. The determinations were carried out by the Central Laboratory of the University Hospital, Lund, through the courtesy of Professor C. G. Holmberg and Dr. S. Hansson.

Results

The results of the haemoglobin estimations are summarized in Table 1. The mean of the determinations is 16·72 g. haemoglobin per 100 ml. blood, which agrees with those of other recent workers (Vahlquist, 1941; DeMarsh, Alt and Windle, 1948; Mollison, 1951; Dochain, Lemage and Lambrechts, 1952; Marks, Gairdner and Roscoe, 1955). Before the 38th week our determinations are too few for any reliable conclusions to be safely drawn. In the 38th week the haemoglobin value is 15·50 g. and in the 39th 16·31 g. In the 40th week the value is 16·98 and remains then at a constant level. Cord blood from the 42 cases with prolonged pregnancy, i.e., children born in the 43rd week or later, does not contain more haemoglobin than cord blood from infants born in the 40th, 41st or 42nd weeks. The mean value in the 43rd week is 16·92 g. and for the other three 17·07 g. per 100 ml.

Discussion

In 1953, Walker and Turnbull published a series of 145 cases in which pregnancy and labour were normal. They found that the haemoglobin level rose steadily from 9 g. per 100 ml. in the 10th week to 14 or 15 g. by the 22nd-24th week. By the 38th week the mean value was 15·2 g. and by the 40th week 16·5 g. When pregnancy was prolonged this rise continued and by the 43rd week the mean value was 18·8 g. Kravkova (1954) also found a rise in the haemoglobin level from the fourth to the tenth month. However, she did not

Table 1

<table>
<thead>
<tr>
<th>Duration of pregnancy in weeks</th>
<th>27</th>
<th>33</th>
<th>35</th>
<th>36</th>
<th>37</th>
<th>38</th>
<th>39</th>
<th>40</th>
<th>41</th>
<th>42</th>
<th>≥43</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haemoglobin (g. per 100 ml.)</td>
<td>11·8</td>
<td>16·2</td>
<td>16·8</td>
<td>15·2</td>
<td>15·9</td>
<td>15·50</td>
<td>16·31</td>
<td>16·98</td>
<td>17·36</td>
<td>16·67</td>
<td>16·92</td>
<td>16·72</td>
</tr>
<tr>
<td>Number</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>7</td>
<td>25</td>
<td>48</td>
<td>117</td>
<td>112</td>
<td>56</td>
<td>42</td>
<td>414</td>
</tr>
</tbody>
</table>
study any cases of prolonged pregnancy. Marks et al. (1955), studying 221 normal infants, were unable to confirm Walker and Turnbull's results, as they found no correlation between cord blood haemoglobin and the foetal gestation time. Our results are thus in accordance with those of Marks et al., since we find that the haemoglobin level is constant from the 40th to the 43rd week. The range in the cord blood haemoglobin is from 11.2 g. to 26.6 g. per 100 ml. Like Marks et al., we observed a wide range in our values, whereas Walker and Turnbull state that the haemoglobin varies relatively little within the weeks.

Walker and Turnbull conclude that the rise in the haemoglobin level seen in late pregnancy is a response by the foetus to the falling oxygen supply. In a previous paper (Rooth and Sjöstedt, 1957) on our investigations into 363 cases we were unable to confirm that there is any decrease in oxygen saturation with advancing pregnancy. And we are now unable to find any correlation between oxygen saturation in the cord vein and the amount of haemoglobin (Fig. 1). A low oxygen saturation observed after normal delivery seems to be of so short a duration that it does not influence the haemoglobin values.

**Summary**

After normal deliveries the amount of haemoglobin and the oxygen saturation in the umbilical vein of newborn infants was determined. The mean haemoglobin level from the 40th to the 43rd week was 17.05 g. per 100 ml. During these four weeks there was no correlation between cord blood haemoglobin and the duration of pregnancy.

There is also no correlation between oxygen saturation in the cord vein and haemoglobin values.

**REFERENCES**

Haemoglobin in Cord Blood in Normal and Prolonged Pregnancy
Gösta Rooth and Sven Sjöstedt

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