INTRAUTERINE HYPOXIA — A PHENOMENON PECULIAR TO THE SECOND TWIN

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During a 5-year period twin births occurring at the university hospital were investigated for the presence of clinical and biochemical symptoms of intrauterine hypoxia. It appears that intrauterine hypoxia, when detectable, is limited to the second twin. Some factors which may influence the oxygenation of the second twin have been analysed, i.e., the mode of delivery, the time interval between deliveries, and the duration of gestation. No single explanation for the genesis of the hypoxia seems to be valid.

Earlier reports by our group dealt with anaerobic metabolism (Derom 1965) and cord blood acid-base balance in twins at the time of delivery (Derom and Thiery 1970). The present study further elaborates on the lactate-pyruvate and acid-base equilibria in twin cord blood.

PATIENTS AND METHODS

In all twin births occurring during the period from 1969 to 1973, cord blood and maternal blood were sampled and analyzed according to procedures and methods described previously (Derom 1966, Thiery 1969, Thiery et al. 1971).

Due to the small size of some infants at birth it was not possible to collect adequate amounts of blood in every case. In 20 primiparae and 29 multiparae at least one blood sample of each twin could be analyzed. For each acid-base component investigated the value obtained in twin B was subtracted from that of twin A.

RESULTS

Intrapair differences are given in Tables 1 and 3 for the primiparae, 2 and 4 for the multiparae.

1. *Primiparae*

In umbilical-artery blood the actual pH of the second twin is on average 0.026 units lower than that characterizing the cotwin. The same phenomenon is observed in umbilical-vein blood, but the mean difference is somewhat higher, amounting to 0.044 pH units. In blood from the umbilical vein the intrapair difference observed for the actual pH is paralleled by that of the base excess. However, only the mean within-pair difference of the actual pH in umbilical-vein blood was found to be statistically significant ($p < 0.05$).

Excess lactate, as a rule, is higher in the second twin, the mean increase measuring 6.92 mg lactate/100 ml of plasma. This difference is statistically significant ($p < 0.05$).

* Aided by grants from the United Cerebral Palsy Research and Educational Foundation, New York, N. Y. (no. R-192-68C) and the Foundation for Medical Research, Brussels, Belgium (no. 1207).

CODEN: AGMGAK 25 314 (1976) — ISSN: 0001-5660
Acta Genet. Med. Gemellol. (Roma) 25: 314-316

https://doi.org/10.1017/S0001566000014331 Published online by Cambridge University Press

Table 1. *Twin deliveries in primiparae. Within-pair differences of cord blood acid-base components*

Case no.	ΔpH_a	ΔpH_v	ΔBE_v
1	— 0.01	0.12	— 4.9
2	0.02	0.04	3.4
3	— 0.02	—	— 1.1
4	0.05	0.20	4.7
5	—	— 0.02	0.3
6	—	0.00	—
7	0.05	0.11	0.6
8	0.25	0.26	5.5
9	—	0.06	—
10	—	0.01	—
11	— 0.01	— 0.01	— 2.4
12	— 0.02	— 0.01	— 1.4
13	—	0.01	—
14	0.07	0.02	2.6
15	— 0.02	0.00	0.2
16	— 0.10	— 0.10	— 4.0
17	—	0.05	—
18	0.04	—	2.1
19	—	0.02	—
20	—	0.01	—
Mean	0.026	0.044	0.43
± SE	0.024	0.020	0.88
	(*ns*)	($p < 0.05$)	(*ns*)

ΔpH_a and ΔpH_v = within-pair difference of actual pH in umbilical artery and umbilical-vein blood, respectively. ΔBE_v = within-pair difference of base excess in umbilical-vein blood.

Table 2. *Twin deliveries in multiparae. Within-pair differences of cord blood acid-base components*

Case no.	ΔpH_a	ΔpH_v	ΔBE_v
1	0.19	0.01	3.0
2	0.05	0.14	3.5
3	—	0.17	4.3
4	— 0.13	—	—
5	0.03	0.03	0.2
6	0.00	0.08	4.5
7	—	0.03	1.4
8	0.00	0.09	2.1
9	—	— 0.16	— 5.1
10	0.12	0.04	— 1.4
11	0.51	0.58	—
12	0.03	0.03	1.4
13	— 0.04	0.07	1.7
14	0.03	0.02	1.3
15	0.02	0.04	1.6
16	— 0.02	0.06	0.8
17	0.05	0.13	6.9
18	0.09	0.06	2.4
19	0.08	— 0.11	— 4.2
20	— 0.05	0.04	— 1.1
21	0.09	0.19	5.3
22	— 0.02	0.01	0.2
23	0.04	0.00	2.9
24	0.09	0.10	3.3
25	0.01	0.00	1.3
26	—	0.11	— 5.0
27	0.04	—	—
28	0.08	0.01	0.8
29	0.04	0.07	0.9
Mean	0.053	0.065	1.269
± SE	± 0.022	± 0.024	± 0.568
	($p < 0.05$)	($p < 0.05$)	($p < 0.05$)

2. *Multiparae*

Both the components of the acid-base balance and the excess lactate show changes comparable to those found in the primiparae. The within-pair differences of pH and base excess are statistically significant ($p < 0.05$) whereas the increase in excess lactate is of borderline statistical significance ($0.1 > p > 0.05$).

COMMENTS

The present data confirm an earlier observation, i.e, that intrauterine hypoxia is a phenomenon peculiar to the birth of the second twin.

Because excess lactate closely correlates with oxygen debt (Huckabee 1958) the degree of hypoxia suffered by the second twin can be assessed. The mean increase of excess lactate found in the present series is not high. Indeed, in normal singleton deliveries fetal excess lactate measures up to 25 mg/100 ml of plasma (Thiery et al. 1971) and probably only values above 36 mg/100 ml of plasma are of clinical significance (Derom 1971). We wish to remind that the figures reported are the increment

https://doi.org/10.1017/S0001566000014331 Published online by Cambridge University Press

Table 3. *Twin deliveries in primiparae. Within-pair differences of fetal excess lactate*

Case no.	ΔXL_{A-B}
1	— 20.2
2	— 9.3
3	— 2.5
4	— 11.9
5	— 3.7
7	— 8.6
8	— 36.4
11	— 3.6
12	0.1
15	0.2
16	—
17	8.3
18	0.4
20	— 2.8
Mean ± SE	— 6.92 ± 3.12 ($p < 0.05$)

ΔXL_{A-B} = difference in excess lactate between twins A and B.

Table 4. *Twin deliveries in multiparae. Within-pair differences of fetal excess lactate*

Case no.	ΔXL_{A-B}
1	— 24.8
2	0.3
6	— 16.9
9	— 4.2
10	4.0
12	— 1.7
14	— 1.6
16	— 5.8
17	— 24.5
20	22.2
21	— 8.1
22	— 1.2
23	— 6.2
24	— 6.4
25	0.8
29	— 11.4
Mean ± SE	— 5.34 ± 2.80 ($0.1 > p > 0.05$)

found in one of the twins with respect to its cotwin. If an increase in twin B is superimposed on a borderline level in twin A, a clinically significant degree of hypoxia may well be attained.

The within-pair difference in oxygenation occurring during labour is but one of the many variables which may interfere with the use of the twin method in anthropological, genetical or clinical research. Influences which do not act to the same degree on both partners of a twin set make it necessary, when studying within-pair differences, to collect as much data as possible concerning perinatal events. Our results indicate, once again, that twin registers, to be fully valid, must include only cases studied at the time of birth and must provide all relevant data concerning pregnancy and delivery.

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https://doi.org/10.1017/S0001566000014331 Published online by Cambridge University Press