Serum Protein Synthesis in Fœtus Haptoglobins and Group-Specific Components

Methods of starch-gel and immuno-electrophoresis allow a division of the haptoglobins (Hp), the group-specific components (Gc) and the transferrins into several genetically determined types[1–3].

The existence of haptoglobin, group-specific component and transferrin proteins in cord sera, which differ from the corresponding maternal protein types, seem to show that new-born children in some cases synthesize their own haptoglobin, group-specific component and transferrin proteins[4–6].

We have recently investigated a twin-couple of still-born fœtuses which were of different sexes and also belonged to different ABO-, MN- and Rh-groups. Both twins had well-developed haptoglobin and group-specific component patterns qualitatively and quantitatively indistinguishable from the adult normal patterns, as determined by starch-gel and immuno-electrophoresis. The blood and serum types of the mother and her two children are given in Table 1 and in Table 2 (Nos. 13–15). The differences in haptoglobin and group-specific component-types between the twins and the mother strongly imply that both twins were able to synthesize their own haptoglobin and group-specific component proteins. As regards the Gm types, the twins and the mother lacked the Gm^a antigen and are thus not informative on the development of the Gm^a character.

Table 1. Blood- and Serum-Groups of Mother and Her Two Still-born Fœtuses

	Blood group	Serum group		
		Gm-type	Hp-type	Gc-type
Mother	A MN Rh_1rh	$a-$	2–1	2–2
Twin 1	O N Rh_1rh	$a-$	2–2	2–1
Twin 2	A M Rh_1Rh_1	$a-$	1–1	2–1

In addition, determinations of haptoglobin were carried out on three, and determinations of group-specific components on six, further fœtal sera ranging in age from 17 to 30 weeks. In two sera (Nos. 4 and 8) haptoglobins were detected with the conventional starch-gel electrophoretic technique with borate buffer and benzidine-staining, and in one of these sera (No. 4) the child belonged to a haptoglobin type different from that of the mother (Table 2). In no case could the group-specific component precipitate be demonstrated (Table 2). Two of the fœtal sera (Nos. 4 and 10) were used in absorption of an anti-immune serum containing antibodies both against the haptoglobins and the group-specific components. Both sera had the capacity of absorbing the antibodies against the group-specific component as revealed by immuno-electrophoretic analysis of the absorbed immune serum against normal sera containing the haptoglobin and group-specific component protein. Serum No. 4 also absorbed the antibodies against the haptoglobins, whereas serum No. 10 did not. The absorption was carried out in the gel according to a technique described previously[7].

Table 2. Clinical and Laboratory Data on Seven Mother–Fœtal Samples

No.		Length (cm)	Age (weeks)	Hp	Gc
1	Mother	—	—	n.d.	2–1
2	Fœtus	18	17	n.d.	absent
3	Mother	—	—	1–1	2–1
4	Fœtus	29	21	2–1	absent
5	Mother	—	—	n.d.	1–1
6	Fœtus	22	20	n.d.	absent
7	Mother	—	—	1–1	1–1
8	Fœtus	17	17	1–1	absent
9	Mother	—	—	2–1	1–1
10	Fœtus	38	30	absent	absent
11	Mother	—	—	n.d.	2–1
12	Fœtus	20	17	n.d.	absent
13	Mother	—	—	2–1	2–2
14	Fœtus 1	30	25	2–2	2–1
15	Fœtus 2	30	25	1–1	2–1

Investigation of cord blood from 71 new-born children in all instances gave well-developed group-specific component patterns, where in 29 cases the group-specific component pattern of the child belonged to another type than that of the corresponding mother (Table 3). As regards the haptoglobins, only 10 per cent of 120 investigated cord sera could be haptoglobin-typed[8]. In a recent work by Bergstrand *et al.*[9], no haptoglobin could be demonstrated in six sera from fœtuses between 16 and 26 cm, nor in 29 cord blood sera.

Table 3. Gc-Types of 71 Mother-Cord Samples (Data from Ref. 5 are included)

Mother			Child		
Gc type	Obs.	Exp.		Gc 1–1	Gc 2–1	Gc 2–2
1–1	42	39·5	obs.	33	9	0
			exp.	31·4	10·7	0
2–1	27	26·9	obs.	12	9	6
			exp.	10·1	13·5	3·5
2–2	2	4·6	obs.	0	2	0
			exp.	0	1·5	0·5

Expected frequencies calculated from Gc-frequencies of 2,259 unrelated Swedes. $Gc^1 = 0{\cdot}7459$, $Gc^2 = 0{\cdot}2541$ (ref. 10).

In conclusion, it seems as if the synthesis of haptoglobin and group-specific component proteins in the fœtus is subjected to great individual variations, which might indicate differences in 'biochemical maturity'. Further work is in progress of using the haptoglobin and group-specific component protein polymorphisms as a 'physiological tagging' in the evaluation of protein synthesis in the fœtus as well as in the evaluation of turnover of passively transferred serum proteins in new-born children and adults.

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PATHOLOGY

Induction of Fibrosarcomas in Mice given a Minute Quantity of 3-Methylcholanthrene or Dibenz(a,h)anthracene as New-borns

The susceptibility of new-born mice to chemical carcinogenesis has been reported from several laboratories within the past two years[1–4]. New-born mice (Swiss, *C3H/P*, *C57BL*) given a single low dose of either 3-methylcholanthrene (3-MC) or dibenz(*a*,*h*)-anthracene (DBA) developed a higher incidence of pulmonary tumours and more tumour nodules per lung in a shorter time than did adult mice[2].

The experiment reported here was designed to determine the minimum carcinogenic dose of 3-MC and