

Identification of Fetal Blood Stains by Radioimmunoassay of α_1 -Fetoprotein

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Summary. Radioimmunoassay of α_1 -fetoprotein(AFP) for medico-legal identification of fetal blood stains using a commercial kit is described. The AFP content in fetal blood stains on filter paper ranged from 21 – 320 ng/9 mm². The protein was detected in stains of adult blood and retroplacental blood in only negligible amounts. Aging of the blood stains did not influence the values up to 1 month. The method is simple and sensitive enough for application to medico-legal-practice.

Key words: Fetal blood stains, Radioimmunoassay of α_1 -Fetoprotein – α_1 -Fetoprotein, fetal blood stains

Zusammenfassung. Es wird die radioimmunologische Bestimmung von α_1 -Fetoprotein(AFP) zum forensischen Nachweis von Fetalblutspuren unter Verwertung eines kommerziellen Bestimmungsansatzes beschrieben. Der Gehalt von AFP in Fetalblutspuren auf Filterpapier betrug 21–320 ng/mm². In Spuren von Erwachsenenblut sowie Retroplazentarblut konnte das Protein nur in äußerst geringfügigen Konzentrationen nachgewiesen werden. Das Spurenalter beeinflusste die Bestimmung bis zu 1 Monat nicht. Die Methode ist einfach und empfindlich genug für die gerichtsmedizinische Praxis.

Schlüsselwörter: Spurenkunde, α_1 -Fetoprotein – Blutspuren, Fetalblut – Fetalblut, Nachweis

Identification of fetal blood stains is important in forensic medicine, particularly in case of infanticide or criminal abortion. Detection of hemoglobin F by immunoelectrophoresis in blood stains was used for the identification [1, 2], and the detection of another fetal specific antigen, α_1 -fetoprotein (AFP), was also applied [3, 4].

Recently the radioimmunoassay for determination of serum AFP level has widely been used in the field of clinical medicine [5-7]. A procedure for determination of

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AFP content in dried blood stains was established (8). The method proved to be sensitive enough to detect AFP in fetal blood stains as small as 0.1 mm² in area.

This paper describes the application of the radioimmunoassay to the forensic diagnosis of fetal blood stains.

Materials and Methods

Fetal blood was obtained from 27 newborns at the time of delivery from the umbilical cord. Retroplacental blood was collected from 8 pregnant women at parturition, and venous blood from 8 normal healthy adults of both sexes. Blood stains were made on filter paper (Toyoroshi No. 2, Tokyo, Japan), allowed to dry at room temperature and examined after 1 day, 1 week and 1 month. For quantitative analysis, 3 mm x 3 mm of the stained filter paper was used, and the blood was extracted with 0.1 ml of horse serum (Grand Island Biological Co.). Each extract was diluted 10-fold with the horse serum, 0.1 ml of which was used for the determination.

Radioimmunoassay was carried out with the use of a Dainabot α_1 -fetoprotein RIA Kit II. We followed the assay procedure recommended by the manufacturer (α -Feto Ria Kit II, Dainabot Radioisotope Lab. Ltd.) The isotopic measurement were performed using a scintillation counter (Toshiba Model RDI-212A, 35 keV window). Each sample was assayed in duplicate.

Results and Discussion

Table 1 summarizes the results of our estimation of AFP in stains of various sources.

The AFP content in 27 fetal blood stains ranged from 21 to 320 ng/9 mm², and the values did not show any decrease up to 1-month-storage. Eight retroplacental blood stains and 8 adult blood stains contained negligible amounts of AFP. Consequently, the radioimmunoassay for AFP can be applied to the forensic diagnosis of fetal blood stains.

It should be taken into account that some patients with a primary hepatoma may exhibit high levels of serum AFP [6].

This method is simple, sensitive and suitable for medico-legal practice.

Table 1. AFP contents in various blood stains

Source of blood stains			AFP content (ng/9 mm ²)		
			1 day storage	1 week storage	1 month storage
Newborns					
No.	Sex	Body weight (g)			
1	♂	2870	56	62	82
2	♀	3460	80	36	49
3	♀	2860	44	28	47
4	♀	3150	54	50	51
5	♀	2660	140	122	203
6	♀	3520	300	139	132
7	♀	3640	216	152	216
8	♂	3460	52	50	53
9	♂	1460	202	230	192
10	♂	3270	240	320	300
11	♀	3600	30	57	67
12	♀	3410	172	170	164
13	♀	3600	35	22	21

Table 1 (continued)

14	♀	3950	49	66	65
15	♂	2240	70	109	117
16	♀	3540	49	54	69
17	♂	3240	226	228	236
18	♀	3020	320	244	210
19	♂	3080	70	102	108
20	♀	3440	226	224	216
21	♂	3100	44	35	48
22	♂	3460	104	128	140
23	♀	3280	90	134	114
24	♂	4100	90	98	94
25	♀	2800	214	220	246
26	♂	2940	190	260	238
27	♀	3240	36	47	38
			126 ± 88 ^a	125 ± 83 ^a	130 ± 78 ^a
Pregnant women					
No.					
1			neg	—	—
2			neg	—	—
3			neg	—	—
4			neg	—	—
5			neg	—	—
6			neg	—	—
7			neg	—	—
8			neg	—	—
Adults					
No.		Sex			
1	♂		neg	—	—
2	♀		neg	—	—
3	♀		neg	—	—
4	♀		neg	—	—
5	♂		neg	—	—
6	♂		neg	—	—
7	♀		neg	—	—
8	♀		neg	—	—

^aThe value represents the mean ± SD

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Received May 30, 1978