# Blood group investigations on fetal tissue

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In contrast to laboratory experiments on fetal material, one often finds in cases of forensic interest fetal fragments mixed with placental tissue and maternal blood.

In 1983 Eriksen reported a case where the identification of a rape suspect depended on blood group determination of placental tissue from an abortion.

Another aspect to the examination of blood group systems from fetal material, which mostly involves older or new born fetuses, is the identification of the mother in cases of illegal abortion and infanticide.

The literature on blood group identification from fetuses is extensive (1,2,3,5,6,7,8,9) but most authors have confined their investigations to the red cell antigens.

In our investigations we have concentrated on determining which blood group systems can be detected in material from abortions between the $6^{th}$ and $13^{th}$ week of pregnancy and how they are expressed.

After a vacuum extraction there is not only fetal material present in the sample but often also placental tissue and maternal blood. For this reason a blood sample from the mother was obtained when possible and tested in the same systems for comparative purposes.

In this investigation the following systems were tested: ABO, PGM, SEP, EsD, ADA, AK, GLO, GPT, Gc, Tf, C'3 and Pi. The ABO antigens were detected using Absorption-Elu-



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tion and Absorption-Inhibition tests, ADA and AK using cellulose acetate membrane electrophoresis and for most other systems isoelectric focusing was used.

The abortion material from 25 terminations was prepared by washing several times in physiological saline followed by homogenisation and centrifugation of the extract. The supernatent was then used for all tests.

The results can best be described by separating them into 3 groups.

The first group consists of those systems in which blood group activity could be regularly identified and in some cases differed from the maternal phenotype.

In the ABO system, the antigens A, B and H could always be identified and the H antigen was found in combination with all other groups in the ABO system. This agrees with the findings of Constantoulakis et al. (1963). It was common in these samples to find additional antigens which the mother lacked but H substance was seldom found alone. The frequency of the B antigen was approximately in agreement with the population frequencies.

Subtyping in the PGM system also produced band patterns which differed from the maternal phenotype. As evidence for the presence of fetal blood group markers in the abortion material, 3 bands were observed in some samples which could normally only be attributed to the products of 3 alleles (Fig. 1 ). The AK 1 phenotype was identified in most samples but in many cases there occurred an additional atypical cathodal band (Fig. 2).

In approximately one half of the samples ADA activity was observed but the bands were often atypical and more cathodic than the normal pattern. Similar findings on placental material were reported by Edwards in 1971.

The intermediate group consists of those systems which often showed weak activity. Activity in the SEP (EAP) system was often observed but only in the B region and in these cases the maternal blood was typed as either B or BA. At present we are not able to prove whether this B band activity is a primitive fetal isozyme or only a low concentration of the enzyme, resulting in the absence of the weaker bands.

Similarly deficient was EsD and where activity was observed, it consisted of only one band where normally two would be found after isoelectric focusing. In these samples the band could also be found in the maternal phenotype. Here again we cannot say if this is a precursor or a low concentration of enzyme.

GPT is also included in this group although a weak 2-1 phenotype could be seen in only 2 samples.

The third group consists of those systems where no activity could be seen and includes Gc, GLO, C'3 and Pi.

From this relatively small number of samples it would be unreasonable to make any statistical calculations as to the frequency of fetal groups in comparison to the adult population. Furthermore, in only approximately one half of the samples could a maternal blood sample be obtained and as placental tissue was normally present and the decidua and intervillous areas are known to possess maternal individuality (Pedal 1985), the results obtained cannot be definitely attributed to the fetus.

From a forensic point of view it can be stated that fetal phenotypes are detectable in some blood group systems.

In practice, a mixture of maternal and fetal material cannot be avoided and therefore before any conclusions

can be made, the maternal phenotype must be taken into consideration.

From these results, blood grouping on abortion material taken from the 6th to the 13th weeks of pregnancy can be recommended in the following systems: ABO, PGM-Subtyping, AK and possibly ADA.

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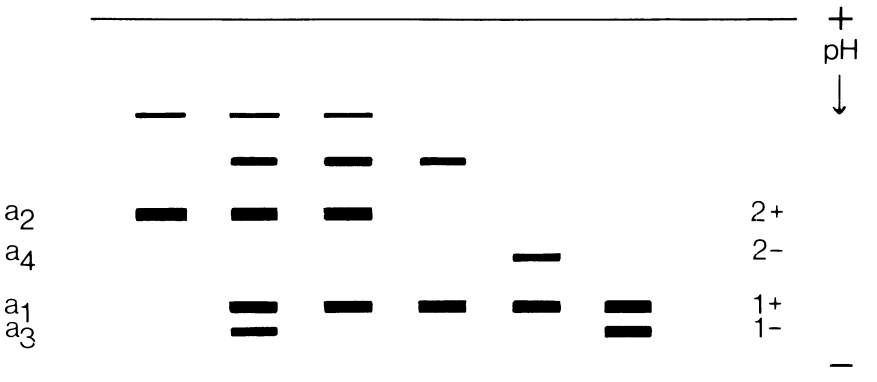
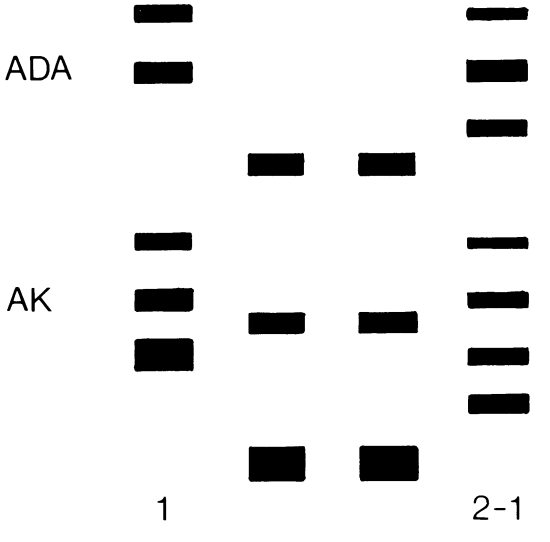



Schematic representation of PGM subtypes

Fig.1




Schematic representation

Fig.2