Absence of Special Fetal Hemoglobin in Beagle Dogs

By Carol N. LeCrone

The metal hemoglobins of most mammalian species have been shown to differ from adult hemoglobins. Electrophoretic mobility, resistance to alkali denaturation, and chromatographic behavior have been used as criteria for distinguishing between hemoglobins of a given species.1

Studies of adult dog hemoglobin have been reported.1,6 The literature, however, does not describe differences in the hemoglobin structure of the fetal, immature and adult dog. The present study has been undertaken to investigate this vacuity.

Materials and Methods

Blood samples were taken from 135 beagle dogs. Twenty-nine fetal dogs ranging in age from 37 to 63 days of gestation were sampled. Eighty-five immature dogs ranging from one day to nine months, and 21 adult dogs ranging from 12 months to 53 months completed the sample. Human adult and umbilical cord bloods were prepared as controls.

Hemoglobin electrophoresis was done according to LeCrone. Standard methods were employed for alkali denaturation,7 acid elution,8 column chromatography and amino acid analyses.9

Results

Agar gel electrophoretic studies showed the hemoglobins from fetuses to be identical with the pigment of immature and adult dogs. The relative electrophoretic velocities of migration of human control fetal and adult hemoglobin and also adult dog hemoglobin agreed substantially with those reported by other investigators.5,10,11

No apparent alkali denaturation differences between fetal, immature and adult canine hemoglobins were observed. The amount of alkali-resistant blood pigment from all dogs investigated was found to range between 3.5 and 3.7 per cent. Human fetal hemoglobin controls, on the other hand, contained 57.2 per cent alkali-resistant hemoglobin, in comparison with 0.8 per cent resistant pigment in the human adult.

Fresh blood smears prepared at the time of sampling for the acid elution procedure8 demonstrated no differences from 50-day dog fetuses through development into adult stages. Human umbilical cord blood smears showed differentiation with fetal cells being stained and obvious, whereas the adult
cells appeared as eluted ghosts. Chromatographic methods are known to isolate almost any hemoglobin component. Differences between the hemoglobin of a 57-day fetus and that of an adult dog were not demonstrated by carboxymethyl cellulose (CMC) or diethylaminoethyl cellulose (DEAE) chromatography. Globin, prepared by a modification of the method of Anson and Mirsky for ion-exchange chromatography of amino acids, demonstrated 17 amino acids in the hemoglobin from a 55-day fetus and from an adult dog. Ratios of each identified amino acid in fetal and adult globin were calculated and no apparent differences were noted.

**DISCUSSION**

No evidence was uncovered to differentiate the hemoglobin of the adult beagle from the hemoglobin of fetal or immature dogs. Stockell et al. found no differences between fetal and adult hemoglobin in the horse. Like the horse, the dog may be another mammal in which placental oxygen is transferred by some means other than a specific fetal hemoglobin.

**SUMMARY**

A distinctive fetal hemoglobin compound easily distinguishable in late prenatal and early postnatal life is present in most mammals. This study, however, has shown no differences between the fetal, immature and adult beagle dog hemoglobin.

**REFERENCES**

Brief Report: Absence of Special Fetal Hemoglobin in Beagle Dogs

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