The white cells were remarkable in that no small lymphocytes, eosinophils, or basophils were seen. Otherwise, their numbers and percentages appear to be near the normal limits. Of interest is the occurrence of "drumstick" appendages in 21 percent of the mature segmented neutrophils. These were described by Davidson and Smith (1954) in human blood as a genetic sex indicator for females. They occur in 1-17 percent of the segmented neutrophils of all human females and are thought to represent the inactivated X-chromosome, analogous to the Barr body observed in most somatic cells. It can be reasonably assumed that also in the whale, drumsticks in the neutrophils are indicators for the female sex.

The uniform electrophoretic mobility of this gray whale's hemoglobin, characteristic of human hemoglobin F, is in accordance with the finding of others (Lenfant, 1969). Of further interest was the hemoglobin's resistance to alkali denaturation. However, no conclusions can be drawn from this coincidental sharing of two physical properties with human hemoglobin F as to functional or structural similarities between these two hemoglobins. The reasons for the alkali resistance of certain hemoglobin variants are poorly understood. In the human this is related not only to the presence of gamma chains in the hemoglobin molecule, but also to the structural relationships of the various chains to each other. For instance, Bart's hemoglobin, composed of four gamma chains, is only half as alkali resistant as hemoglobin F, which is a tetramer of two alpha and two gamma chains. The elucidation of the structure of the gray whale's hemoglobin depends on the full analysis of its amino acid sequence. Such an undertaking can also be expected to provide some evolutionary clues for the California gray whale.

From the evidence presented here, it appears that this species possesses only one type of structurally uniform hemoglobin, although the possibility that we are dealing with two or more hemoglobins of identical electrophoretic mobility and alkali resistance cannot be entirely excluded.

The band of non-heme protein appears to be analogous to a similar band which is consistently seen in the electrophoretograms of human bloods. In the latter, this is known to represent carbonic anhydrase B, a red cell constituent persistently extracted with the toluene hemolysates.

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MFR PAPER 1050

Some Coagulation Factors in Plasma from a California Gray Whale, *Eschrichtius robustus*

W. MEDWAY

ABSTRACT

A citrated plasma sample was assayed for some coagulation factors. The levels obtained were compared with those from some of the small toothed whales. Factor XII activity was very low in the gray whale sample, whereas toothed whales have none.

INTRODUCTION

Many people working with small odontocete whales in captivity have made the observation that whale blood has a prolonged clotting time. Since this observation was made two reports have described the lack of clotting Factor XII in blood in some of the smaller whales (Lewis, Bayer, and Szeto, 1969; Robinson, Kropatkin, and Aggeler, 1969). Another publication reports a prolonged clotting time of blood from other small whales; however, assays for Factor XII were not made (Ridgway, 1972). There were no reports of similar studies on blood from any baleen whale; hence this report on some studies on a plasma sample from a captive California gray whale, *Eschrichtius robustus*.

MATERIALS AND METHODS

A citrated plasma sample was obtained from a young (1-2 years) female California gray whale kept in captivity in San Diego, Calif. The sample was deep-frozen and shipped via air express to Philadelphia where the assays were made. The plasma sample was slightly lipemic. The prothrombin time, partial thromboplastin time, Factor V, Factor XI, and Factor XII assays were made in the Coagulation Laboratory at the Hospital of the University of Pennsylvania. It was not possible to do a fibrinogen assay on the sample.

Standard laboratory procedures employing commercial reagents were used to conduct the assays, with the exception of Factor XII where dolphin, *Tursiops truncatus*, plasma was used as the substrate. Plasma reagent from Factor XI deficient cattle was used for the Factor XI assay.

RESULTS AND DISCUSSION

The results of the assays on the gray whale plasma and some results on a few odontocete whales, from the literature, are shown in Table 1.

Table 1.—A comparison of some clotting factors between odontocete whales and a baleen whale. The numbers in parentheses indicate the number of samples.

	Tursiops truncatus[1,2,3]	*Orcinus orca*[2]	*Eschrichtius robustus*
Prothrombin time (sec)	17.0(14)	15.6(3)	26.5(1)
Partial thromboplastin time (ptt) (sec)	346 (15)	216 (3)	107 (1)
Factor V(%)	136 (14)	239 (3)	17 sec (1)
Factor XI (%)	92.7(14)	146 (3)	24.6(1)
Factor XII (%)	0 (15)	0 (3)	3.4(1)

[1] Lewis, Bayer, and Szeto (1969).
[2] Robinson, Kropatkin, and Aggeler (1969).
[3] Ridgway (1972).

The divergence of our results on the gray whale plasma for prothrombin time, partial thromboplastin time, Factor V, and Factor XI assays from those of the two species of odontocete whales can be explained perhaps on the elapsed time between sampling and assay. The presence of a low level of Factor XII in the gray whale plasma to the non-existence in odontocete plasma warrants some consideration. The significance of this difference teleologically is not known. One of the problems encountered by deep diving humans is decompression sickness. This sickness is attributed to the formation of microclots (disseminated intravascular coagulation) with resulting consequences. It is known that slow-moving acid blood has a propensity to clot faster. This property has been attributed to activation of Factor XII and subsequent clot formation.

Whales dive deeply and are not believed to suffer from decompression sickness. Perhaps the lack of Factor XII or low levels of it is nature's way of protecting the animals.

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MFR PAPER 1051

Fluorescent Karyotype of the California Gray Whale

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ABSTRACT

The fluorescent karyotype of the California gray whale, Eschrichtius robustus, *is presented and the use of the fluorescent banding technique for distinguishing between various cetacean karyotypes is discussed.*

The California gray whale, *Eschrichtius robustus* (Gibbosus) has a diploid chromosome number of 44 (Benirschke's unpublished data cited in Kulu, 1972; Arnason, 1972). Since reporting of the gray whale karyotype,