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Source: Journal of Wildlife Diseases, 12(4) : 526-530

Published By: Wildlife Disease Association

URL: <https://doi.org/10.7589/0090-3558-12.4.526>

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CLINICAL BLOOD VALUES OF THE NORTHERN FUR SEAL, *Callorhinus ursinus*¹

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Abstract: Clinical blood values are reported for 14 blood components in the northern fur seal (*Callorhinus ursinus*) and compared with human clinical ranges. Certain values such as cholesterol, globulins and blood urea nitrogen deviate markedly from published human values. The distribution of serum proteins in fur seals, man and northern elephant seals also are given and compared.

INTRODUCTION

Establishment of a pattern of clinical blood values is an indispensable part of professional animal disease management. Due to the many problems associated with observing and handling marine animals, comparative clinical parameters may be an invaluable aid in arriving at sound conclusions regarding their health and well-being. Unfortunately, relatively little reliable data on these animals have been published, and this generally is incomplete. In the present paper we report the results of rather extensive analyses of sera collected in the Pribilof Islands, Alaska from the fur seal, *Callorhinus ursinus*, in the hope that the data will assist in the successful management of the seal herds on these islands.

MATERIALS AND METHODS

Sera were collected in July, 1974, during the annual fur seal harvest on St. Paul Island, Alaska. The animals are carefully herded a distance varying from a few hundred meters to a kilometer, depending on the rookery. While great efforts are taken to minimize discomfort

during herding, the animals occasionally overheat, and are therefore under an unknown degree of stress just prior to death. Twenty blood samples, taken aseptically from freshly killed bulls (2-4 years) at North-East Point rookery, were allowed to clot. The clots were ringed and the samples refrigerated for up to 12 hrs then centrifuged. Sera were decanted, frozen and shipped to our laboratory for analysis. Great care was taken to minimize hemolysis during collection and handling; nevertheless some hemolysis occurred due to the fragile nature of the seal erythrocytes. A 2 ml portion of each sample was stabilized with fluoride (12.5 mg sodium fluoride + 10 mg potassium oxalate) and used for glucose assay. Because the high fluoride content might cause problems with enzyme inhibition,² glucose levels in several fluoride and non-fluoride samples were compared; no differences were detected.

Sera were analyzed with a semi-automated Digitek® clinical analyzer.² This instrument is a filter-type, multi-wave-length colorimeter, from which results can be read out digitally as optical density (OD) values or, by incorporation of

¹ This work was sponsored by the Marine Mammal Commission under contract No. 4A-C010.

² Bio-Dynamics, Inc., 9115 Hague Road, Indianapolis, Indiana, 46250, USA.

appropriate factors, directly in units applicable to the assay (g/dl, IU, etc.).

Unitest® kits² were used to make the analyses. Instrument operation and calibration were monitored with pre-analyzed Bio-Trol® control sera.²

One milliliter serum samples were fractionated on a Sephadex G-200 column (63 cm x 2.6 cm). Fractions were eluted with 0.1 M Tris in 1M sodium chloride, pH 8.0 and monitored by UV spectrometer.

RESULTS AND DISCUSSION

Fur seal serum samples were analyzed for 14 components. The final compilation of averaged values is given in the table, and comparable values are included for man, horse, dog and cat.

The format used in the table was selected after considerable deliberation. Much confusion exists in the literature with regard to the best method of reporting such data. Arithmetic mean values \pm one or two standard deviations are often quoted with the assumption, tacit or otherwise, of a "normal" distribution. However, in many cases where biological data are involved, a log-normal distribution is more likely and failure to take this into account can result in misleading averages and ranges.

Unfortunately where 20 or fewer data points are available, as in the present case, it is usually impossible to determine whether a normal or log-normal treatment is the most appropriate. Therefore a non-parametric presentation of the data was selected. The averages are given together with the maximum and minimum values. It should be noted however, that this approach is not without its hazards since the presence of abnormal values will extend the resulting range beyond its "normal" boundaries.

Acknowledgments

The authors would like to express their appreciation to Dr. A. W. Smith and Mr. H. Bray for their assistance in the collection and processing of serum samples.

In comparing fur seal values with man, while many of the assays are comparable, a number of values are substantially higher than their human counterpart. The elevated enzyme levels found for lactate dehydrogenase (LDH), serum glutamate-oxalacetate transaminase (SGOT) and alkaline phosphatase probably result from unavoidable hemolysis of the blood samples, or possibly reflect the degree of stress associated with the herding of the seals prior to their death. (Interestingly, serum glutamate-pyruvate transaminase (SGPT) does not show this elevation).

Other "elevated" blood components include cholesterol, 60% higher, of special interest in view of its postulated involvement in atherosclerosis, especially when present in excessive amounts. High values previously have been reported for the southern elephant seal, *Mirounga leonina*.³

The high blood urea nitrogen (BUN) value confirms previous reports^{1,6} of generally high levels in sea mammals.

The globulins level is also substantially higher. Fur seal serum contains 40% more globulins and the latter comprise 57% of the total proteins compared with 41% in man. These results were confirmed by serum protein fractionation profiles shown in Figure 1 (A and B). A similarly high ratio (but not absolute amount), reported by Lane *et al.*³ in the southern elephant seal has been confirmed in the northern elephant seal, *Mirounga angustirostris*, by our own protein profile (Figure 1 C).² We have no explanation for the elevated globulin levels at this time. High levels are not found in the fur seal pups (Figure 1 D), nor apparently in other sea mammals (cetaceans).^{4,5}

[3] Serum kindly supplied by Dr. John C. Sawyer; collected on Ano Nuevo Island, California, USA.

TABLE 1. Clinical values for the northern fur seal, *Callorhinus ursinus* measured with the Digitek Clinical Analyzer.

| Serum Component | No. of animals | Average Value | Minimum | Maximum | Normal Human Range ³ | Normal Equine Range ³ | Normal Canine Range ³ | Normal Feline Range ¹ |
|----------------------------|----------------|---------------|----------|------------------------|---------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Total Protein g/dl | 20 | 7.1 | 6.4 | 8.2 (7.8) ¹ | 6-8 | 5.7-7.9 | 5.4-7.1 | 5.4-7.2 |
| Calcium mg/dl | 20 | 11.5 | 10.3 | 12.4 | 9-12 | 11-13 | 8-12 | 6-10 |
| BUN mg/dl | 20 | 40.8 | 29.5 | 49.9 | 7-20 | 15-30 | 15-25 | 20-30 |
| Cholesterol mg/dl | 20 | 319 | 188(230) | 509(421) | 150-250 | 75-150 | 140-280 | 95-130 |
| Bilirubin mg/dl | 20 | 1.8 | 0.3 | 9 (4.2) | 0.2-1.2 | 0-2.0 | <1.0 | 0.2-0.3 |
| Globulins g/dl | 20 | 4.0 | 3.1 | 4.8 | 2.3-3.5 | 1.8-3.3 | 2.8-3.4 | 2.4-4.8 |
| Inorganic phosphorus mg/dl | 20 | 5.6 | 4.0 | 7.2 | 2.5-5.0 | 3.1-5.6 | 4.0-9.0 | 4.5-8.1 |
| Glucose mg/dl | 18 | 96 | 12 | 187 | 60-110 | 60-100 | 70-100 | 60-100 |
| Uric Acid mg/dl | 19 | 3.1 | 1.8 | 5.5 | 2.7 | ² | <1.0 | ² |
| Creatinine mg/dl | 19 | 1.4 | 1.0 | 1.7 | 0.5-1.5 | 1.2-1.9 | 1-2 | 0.8-1.8 |
| Alkaline phosphatase IU | 20 | 48 | 31 | 89 | 9-35 | <75 | <48 | <53 |
| SGPT mU/ml | 20 | 21 | 17 | 30 | 4-25 | — | — | — |
| SGOT mU/ml | 17 | 106 | 83 | 144 | 5-20 | — | — | — |
| LDH mU/ml | 20 | 708 | 641 | 1028 | 30-110 | — | — | — |

¹ Nos. in parenthesis are the result of eliminating excessively high or low values.² Not applicable.³ Values taken from compilation by Bio-Dynamics Inc.

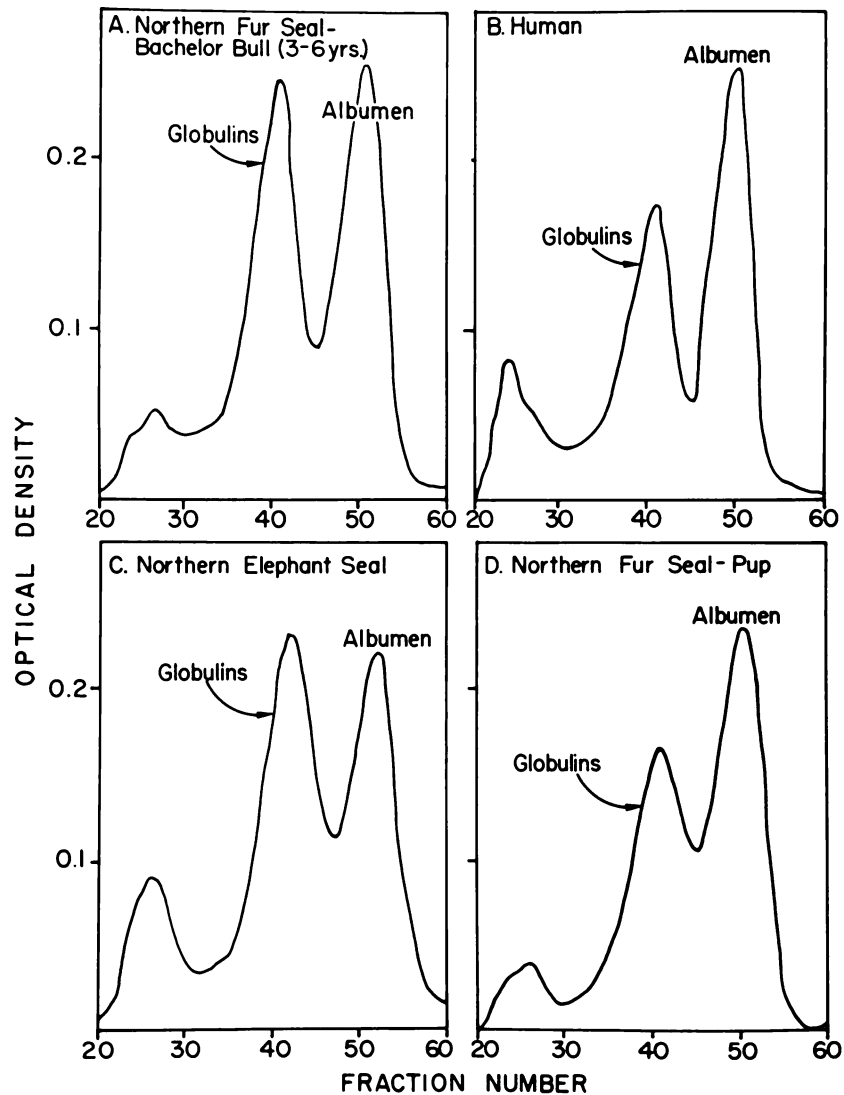


FIGURE 1. Fractionation of serum proteins.

- A. Northern fur seal—bachelor bull (3-4 years old).
- B. Human.
- C. Northern elephant seal.
- D. Northern fur seal—pup.

Conditions:

Serum: 1 ml
 Column: Sephadex G-200 (63 cm x 2.6 cm).
 Eluant: 0.1 M Tris in 1M NaCl, pH 8.0.
 Fraction size: 5 ml.

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Received for publication 1 March 1976