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BLOOD PLASMA CHEMISTRY OF THE SPOTTED DOLPHIN, *STENELLA ATTENUATA*, AND SPINNER DOLPHIN, *S. LONGIROSTRIS*

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INTRODUCTION

Analyses of the constituents of blood plasma have been widely used in both human and veterinary medical fields. The analyses, depending on the constituents tested for, are used regularly to detect disease, to determine the extent of injuries to various organs and to determine whether or not the animal is in a normal state of health. Several workers have described various cetacean blood plasma parameters (Geraci and Medway 1974; Geraci and St. Aubin 1979; Geraci, Letellier and Medway 1965; Medway, Schryver and Bell 1966; Medway and Geraci 1965; Malvin and Rayner 1968; Ridgway 1972).

Coe and Stuntz (1980) described a suite of behavioral patterns that they called "passive behavior" in dolphins of the genus Stenella, that had been captured by the purse seine fishery for yellowfin tuna, Thunnus albacares. They suggested that one of the potential causes of passive behavior was capture stress or capture myopathy such as has been recorded among African ungulates during capture and captivity (Harthoorn 1973). The yellowfin tuna purse seine fishery has been described by Perrin (1969).

One method of determining whether or not capture stress occurs in dolphins involved in the yellowfin tuna purse seine fishery is to measure the effects of stress on blood plasma constituents (Colgrove 1978; Geraci and Medway 1973). To do so, one must know which blood-plasma parameters are sensitive to severe stress levels and of course, must have a baseline of values with which to compare the experimental values. This paper reports some baseline values for the spotted dolphin, *Stenella attenuata* and for the spinner dolphin, *S. longirostris*. In addition, we attempted to learn something about sources of error in the process of collecting, storing and analyzing blood-plasma samples.

MATERIALS AND METHODS

Stenella longirostris (spinner dolphin)

Spinner dolphin blood was taken from five captive Hawaiian spinner dolphins at Sea Life Park (Waimanalo, Hawaii). Sampling took place bi-weekly for a period of 6 months. The animals were not given the morning feeding until after sampling. Prior to blood sampling, the animals were moved into a small holding tank, which was then nearly drained to facilitate handling. Disposable plastic sterile syringes with 20 gauge 1" needles were used to draw blood from the flukes. Blood was emptied from syringes into lithium/heparin coated Vacutainers (Becton, Dickinson and Co., Rutherford, New Jersey), EDTA (Na_2) Vacutainers*, and untreated Vacutainers (silicon coated). Heparinized samples were centrifuged immediately following sampling, to obtain plasma fractions. Whole blood was allowed to clot at room temperature after which serum was removed. Vacutainers with powdered EDTA (Na_2) were refrigerated immediately. All samples were then sent on ice to Interhealth Laboratories* (San Diego, California) via air freight where analysis took place the following day. Plasma from the last four sample sets (Nos. 10-13) was saved after

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*Use of a brand name does not imply endorsement by the National Marine Fisheries Service.

analysis and frozen at -40°C. These samples were later reanalyzed to test the effects of freezing and storage on blood parameters measured.

Stenella attenuata (spotted dolphins)

Spotted dolphin blood samples were obtained during a research cruise of the commercial tuna purse seiner M/V Queen Mary (August 1978). Pelagic spotted dolphins were captured in association with yellowfin tuna, *Thunnus albacares*, and released from the purse seine into a holding pen. The pen is a portion of a porpoise school impoundment system which was designed for studying entire schools of pelagic dolphins (Jennings, Coe and Gandy, in press). Blood samples were taken from 34 spotted dolphins during two purse seine sets. Forty ml of blood was drawn from the flukes of each animal using sterile plastic syringes fitted with 1-1/2" 18 gauge disposable needles. Each animal was sexed, measured, and categorized by color pattern into an appropriate age class (Perrin 1970; Perrin, Coe and Zweifel 1976), before being released. The dolphins were not recaptured for repeat samplings. Blood was emptied from syringes into lithium/heparin coated Vacutainer tubes. These tubes were centrifuged, the plasma was separated and placed in plain Vacutainer tubes and frozen at -60°C or below. The plasma was stored frozen until analysis was performed by Interhealth Laboratories in San Diego 4 weeks later.

Serum Analysis

All serum samples were analyzed with a Technicon SMAC* High Speed Computer-Controlled Biochemical Analyzer. Standard SMAC techniques (Technicon, 1975) were employed, except for the glucose, uric acid and cholesterol procedures, which had been updated (Snyder and Leon 1976).

Prior to testing a sample on the SMAC, technicians inspected the samples visually and characterized each sample as 1) hemolyzed, 2) hyper-lipemic, 3) lipemic, 4) hazy, or 5) clear. CPK (creatine phosphokinase) and LDH isozymes (lactic dehydrogenase) were done separately. CPK analysis for spotted dolphins was done manually using Worthington's* statzyme CPK-N-1 kit, which is based on the colorimetric methods of Oliver (1955) and Rosalki (1967). Spinner dolphin plasma CPK was analyzed using Helena Laboratories super CPK isoenzymes kit (flourescent electro-phoresis procedure). LDH isozymes were also anayzed by electrophortic procedures.

Statistical Analyses

All statistical analyses of the plasma constituents data were accomplished using BMDP statistical software (Dixon and Brown, UCLA 1979).

To deal with correlations among variables, we used stepwise discriminant analysis to select variables that were most influential in differentiating between groups. Because the standard deviations of most of the variables are correlated with the means (are not independent of their means), observations were first transformed into common logarithmic scale to stabilize variances before discriminant analyses were performed.

The discriminant analysis in BMDP produces m discriminant functions when m groups are compared. In our case one has:

$$y_i = A_{io} + \sum_{j=1}^{J} A_{ij} \log_{10} X_j$$

where X_j's are selected variables (serum constituents) j=1,...J

A_{io} is the constant term

A_{ij}'s are the coefficients

i = 1, 2...m (groups).

A sample of observations $(X_i,...X_j)$ would be classified as group i_o When $1 \leq i_o \leq m$ if y_{io} $(X_1,...X_j)$ is the maximum among $y_i, \ldots {}_m$. THus a sample of m=2 belongs to group 1 if $y_1 > y_2$ and vice versa.

In statistical analyses of the data on paired fresh vs frozen samples collected from the captive spinner dolphins, only matched pairs were analyzed, to minimize variation. Matching fresh and frozen values were first used to calculated differences in values of each variable for each of the nine paired cases. The differences in logarithmic values were used e.g., Log Glucose (Fresh) - Log Glucose (Frozen) = D (Glucose$_1$). The "D" values (differences) were then compared with zero, using a discriminant analysis procedures.

T-tests were also used for each individual variable in various comparisons, e.g., hemolyzed and non-hemolyzed groups, fresh and frozen groups. Logarithmic transformations were not used. The significant variables in some cases were different between discriminant analysis and T-tests. This is most likely due to the correlations among variables, which T-tests do not take into consideration.

RESULTS

Spinner Dolphins

During the 6-month sampling period, two of the captive spinner dolphins died. We therefore analyzed samples from them separately from those animals that survived the entire sampling period. Hemolysis, whether or not the animal had survived the entire sampling period, and freezing, each affected various serum constituents and are discussed in turn below.

emolyzed vs. Non-Hemolyzed Samples

Based on data from all animals (N=5), the discriminant analysis elected the following plasma constituents; that most clearly distinguish on-hemolyzed samples from hemolyzed samples: 1) bilirubin, 2) potassium,) calcium, 4) chloride, and 5) albumin. Coefficients for the spinner non-emolyzed (y_1) vs. hemolyzed (y_2) classification function were:

$$Y_1 = (2392.40) \text{ Log (potassium)} + (39081.12) \text{ Log (chloride)}$$
$$+ (3703.03) \text{ Log (calcium)} + (51.23) \text{ Log (bilirubin)}$$
$$+ (10789.13) \text{ Log (albumin)} + (42181.51)$$

$$Y_2 = (2434.68) \text{ Log (potassium)} + (39275.62) \text{ Log (chloride)}$$
$$+ (3785.97) \text{ Log (calcium)} + (59.42) \text{ Log (bilirubin)}$$
$$+ (10869.65) \text{ Log (albumin)} + (42567.15)$$

he analysis routine correctly classified 86% (21/25) of the hemolyzed amples as hemolyzed.

The same analysis was conducted for non-hemolyzed and hemolyzed amples from those animals that survived the entire sampling period. he most discriminating variables were: 1) chloride, 2) bilirubin,) potassium, and 4) globulin.

$$Y_1 = (1155.73) \text{ Log (potassium)} + (98052.35) \text{ Log (chloride)}$$
$$+ (782.92) \text{ Log (bilirubin)} + (708.84) \text{ Log (globulin)}$$
$$+ (-101139.27)$$

$$Y_2 = (1213.17) \text{ Log (potassium)} + (98393.19) \text{ Log (chloride)} + (792.94) \text{ Log (bilirubin)} + (683.33) \text{ Log (globulin)} + (-101852.86)$$

The correct classification rate was 94% (15/16) for both hemolyzed and non-hemolyzed samples.

Statistical comparisons (T-test) were made for each plasma constituent between all hemolyzed and non-hemolyzed samples. Significant differences were found between means of the following serum constituents:

Uric acid ($P = 0.048$), sodium ($P = 0.031$), bilirubin ($P = 0.004$), albumin ($P = 0.045$), LDH_2 ($P = 0.004$), LDH_3 ($P = 0.034$), LDH_5 ($P = 0.012$). When the same tests were done using only cases from animals that survived, sodium ($P = 0.033$), chloride ($P = 0.004$), inorganic phosphates ($P = 0.021$), and bilirubin ($P = 0.013$) were significantly different.

"Died" and "Survived" Comparisons

When both non-hemolyzed and hemolyzed samples were used, the variables most important in discriminating between "died" (Y_1) and "survived" (Y_2) were: 1) SGPT, 2) albumin, 3) CPK, 4) chloride, 5) glucose, and 6) urea nitrogen (BUN).

$$Y_1 = (-1428.61) \text{ Log (glucose)} + (3318.41) \text{ Log (BUN)} + (41989.72) \text{ Log (chloride)} + (687.88) \text{ Log (SGPT)} + (2497.94) \text{ Log (albumin)} + (-729.12) \text{ Log (CPK)} + (-45895.88)$$

$$Y_2 = (-1376.11) \text{ Log (glucose)} + (3265.25) \text{ Log (BUN)} + (41599.47) \text{ Log (chloride)} + (655.086) \text{ Log (SGPT)} + (2643.16) \text{ Log (albumin)} + (-709.65) \text{ Log (CPK)} + (-45145.10)$$

The classification rate was 100% correct for "died" (18/18) and for the "survived" groups (36/36).

The same analysis, using non-hemolyzed samples only (Tables 1 and 2) resulted in a classification rate of 100% for the "died" (6/6) and for the "survived" (16/16) groups. Discriminating variables were: 1) SGPT, 2) albumin, 3) chloride, 4) calcium, and 5) globulin.

$$Y_1 = (157266.21) \text{ Log (chloride)} + (25272.15) \text{ Log (calcium)} + (4045.63) \text{ Log (SGPT)} + (-14496.79) \text{ Log (albumin)} + (-1033.78) \text{ Log (globulin)} + (-175770.18)$$

$$Y_2 = (155923.69) \text{ Log (chloride)} + (24781.80) \text{ Log (calcium)} + (3964.64) \text{ Log (SGPT)} + (-13877.46) \text{ Log (albumin)} + (-957.51) \text{ Log (globulin)} + (172722.24)$$

Statistical comparisons were made for each plasma constituent between "died" and "survived" samples. Significant differences were found between means of 13 of the 28 variables (T-tests, Table 1). In particular, serum enzymes SGPT, SGOT and LDH in the "died" group were elevated. SGPT is highly correlated with SGOT and LDH. In the "died" group the correlation coefficient was 0.94 between SGPT and SGOT and between SGPT and LDH. For the survived group the correlation coefficients were 0.62 between SGPT and SGOT and 0.74 between SGPT and LDH.

Fresh vs. Frozen Samples

A discriminant analysis of paired fresh and frozen samples (Table 3) utilized only data from non-hemolyzed "survived" cases. Those most significant variables were: 1) SGPT, 2) serum iron, 3) inorganic phosphates, 4) cholesterol, 5) SGOT, 6) potassium, and 7) LDH_2. The classification rate was 100% (9/9).

T-tests on the same paired cases (grouped as fresh or frozen) gave significant differences between means only for SGPT ($P = 0.000$) and LDH_2 ($P = 0.004$).

Spotted Dolphins

Spotted dolphin blood samples were analyzed statistically to determine the effects of hemolysis, to be projected as "died" or "survived" according to the classification function developed from spinner dolphin plasma, and to examine plasma chemistry differences due to sex. Because all spotted dolphin plasma samples were frozen, we were unable to test the effects of freezing. As stated, earlier samples were classified visually as being hazy, hemolyzed, lipemic, hyperlipemic or clear. Spotted dolphin plasma samples were primarily either hazy (N=17) or slightly hemolyzed (N=13). Two samples were hyperlipemic, one was lipemic and one clear.

Effects of Hemolysis

Based on data from all (N=32) spotted dolphins sampled, the discriminant analysis selected the following variables which most clearly distinguished hazy (Y_2) samples from slightly hemolyzed (Y_1) samples: 1) SGPT, 2) SGOT, 3) potassium, 4) serum iron, and 5) alkaline phosphatase. The discriminant function was

$$Y_1 = (-29.32) \text{ Log (potassium)} + (450.29) \text{ Log (serum iron)} + (273.30) \text{ Log (SGOT)} + (244.73) \text{ Log (SGPT)} + (305.09) \text{ Log (alkaline phosphatase)} + (-1440.92)$$

$$Y_2 = (-68.35) \text{ Log (Potassium)} + (420.56) \text{ Log (serum iron)} + (333.02) \text{ Log (SGOT)} + (192.33) \text{ Log (SGPT)} + (290.73) \text{ Log (alkaline phosphatase)} + (-1363.97)$$

The analysis routine correctly classfied 100% of both hazy (17/17) and hemolyzed (11/11) samples. The two hyperlipemic samples were classified as hemolyzed, the lipemic sample was classfied as hazy and one non-hemolyzed (clear) sample was incorrectly classfied as hemolyzed. Comparisons between the means of hemolyzed and hazy samples were made for each plasma constituent. Significant differences (T-test) were found between means of hemolyzed and hazy samples for potassium ($P = 0.001$), and SGPT ($P = 0.010$).

"Died" and "Survived" Classification Functions

Used for Spotted Dolphin Blood Values

To test the predictive value of the discriminate function developed using non-hemolyzed spinners, for the "died" and "survived" classifications, the same function was used to classify the spotters sampled. In other words, similar metabolic conditions in spotted dolphins were tested for by comparing plasma values from spotted dolphins with those of the two spinner dolphins that died and the three that remained alive. Since spotted dolphin plasma had been frozen and stored prior to analysis, SGPT and LDH were eliminated because in our analyses of spinner dolphin ~~serum~~ plasma we had found that both SGPT and LDH_2 were significantly affected by freezing and storage. Variables selected in the discriminant classification were: 1) SGOT, 2) albumin, 3) calcium, 4) globulin, and 5) chloride.

$$Y_1 = (124199.98) \text{ Log (chloride)} + (33072.97) \text{ Log (calcium)} + (3737.95) \text{ Log (SGOT)} + (-15492.02) \text{ Log (albumin)} + (-354.71) \text{ Log (gloublin)} + (-145086.53)$$

$$Y_2 = (123411.19) \text{ Log (chloride)} + (32331.29) \text{ Log (calcium)} + (3648.39) \text{ Log (SGOT)} + (-14756.39) \text{ Log (albumin)} + (-289.48) \text{ Log (gloublin)} + (-142960.27)$$

The classification rate remained 100% correct for both "survived" (Y_2) and "died" (Y_1) spinner dolphins and the spotted dolphins were all classified as "survived" (0/32 = died/survived).

Males vs. Females

All 34 samples were used to test for differences between means of variables for the 14 male and 20 female spotted dolphins sampled. Only total protein (P = 0.013) and globulin (P = 0.013) were significantly different between males and females. Average total protein value for males was 6.8 mg/dl and 6.4 mg/dl for females. Globulin averaged 3.2 mg/dl in males and 2.8 mg/dl in females.

DISCUSSION

Because blood is such a dynamic substance, one must control or measure the effects of a number of external variables before interpreting plasma chemistry values. In our case when working with the Hawaiian spinner dolphins we found that hemolysis, freezing and whether or not the animals were healthy all affected various plasma constituents.

The most important variable in our analysis of the spinner dolphin blood was the health of the animals. When only the "survived" group was considered, the variance of the plasma constituent levels decreased considerably for SGOT, SGPT, & LDH (Tables 1 and 2). The two animals that eventually died had highly variable levels of those plasma constituents throughout the sampling period.

Another variable that must be controlled is the degree of hemolysis. Cetacean red blood cells are very fragile (Ridgway 1972) and the serum samples must therefore be treated carefully to avoid hemolysis. Hemolysis of dolphin red blood cells has somewhat different effects than does hemolysis in some other mammals. For example, in human blood, hemolysis results in a very great elevation of LDH (Benjamin and McKelvie 1978). In dolphin blood on the contrary, samples taken from healthy animals did not show significant differences in LDH levels between hemolyzed and non-homolyzed samples. Other dolphin plasma constitutents however, did change with hemolysis. Sodium, chloride, inorganic phosphates, and bilirubin all increased significantly in hemolyzed samples.

Investigations of the blood chemistry of wild populations of animals may often mean that the investigators are out of reach of laboratory facilities. This is true in our situation, where blood samples must be collected in the tropics aboard commercial fishing vessels. To preserve our blood samples from the spotted dolphins we froze the plasma. Freezing plasma results in different changes depending on the species involved (Warner, Tomb and Diehl 1979). Thus, while taking samples from the captive spinner dolphins, we were interested in the effects of freezing on the plasma constituents. Freezing significantly affected only SGPT and LDH_2. SGPT values decreased by 47% on the average after freezing. LDH_2 was also decreased.

Utilizing the above information on variables that affect plasma chemistry, we used data from animals that survived the entire sampling period and in which the samples had not been hemolyzed to represent "normal" plasma chemistry values for spinner dolphins (Table 2). The major assumption inherent in these "normal" values is that the animals from which these samples were collected are in fact healthy. We have no way of being certain that some or all of our healthy animals are not being certain that some or all of our healthy animals are not being affected in a chronic fashion by some disease that would cause variation in the plasma constituents. Alternatively, we have no data that suggest a state of chronic ill health for these animals.

The relatively large number of spotted dolphins sampled allowed us to look for differences between males and females. Of all the constituents tested, only globulin and total protein were significantly different between males and females.

The effects of hemolysis were detectable in spotted-dolphin plasma samples as in spinner dolphins. Interestingly, however, the results of hemolysis were different between spotted dolphins and spinner dolphins. There may be several reasons for the differences; first, the spotted dolphin samples were in general only slightly hemolyzed, as opposed to the spinner-dolphin samples, in which hemolysis was often quite severe. Second, the spinner dolphins fasted overnight before blood was drawn. We were unable to control the feeding of the newly captured spotted dolphins. Third, there may be species-specific differences in the chemistry of red blood cells between spotted and spinner dolphins. Finally, the spotted-dolphin plasma had been frozen, whereas the spinner-dolphin samples were fresh.

For the spotted-dolphin plasma samples, our best estimates of "normal" plasma constituent levels are presented in TAble 4. Refinements of these values could be made if captive animals were available for study over a long period so that feeding could be controlled.

CONCLUSIONS

In any analysis of blood-plasma constituents, care must be taken in the sampling process to control as many variables as possible. Comparisons between samples collected in differing situations may be unreliable. A great deal more information is needed on the blood plasma chemistry of cetaceans, before the information can be used routinely to detect ill health in captive animals or levels of stress in freshly captured animals. The substantial differences which we found between the animals which died and those that survived indicate that if these kinds of analyses were a standard practice, they could be useful in detecting ill health long before behavioral symptoms became apparent. The early detection of ill health might allow the treatment of the animal and thus increase the survival rate of small cetaceans in captivity.

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Table 1. Means and standard deviations of plasma constituents from the two Hawaiin spinner dolphins which died during the sampling period. Only fresh non-hemolyzed samples are included.

Variable (Units)	P Value	Mean	Standard Deviation	Minimum Value	Maximum Value	N
Glucose (mg/dl)	*.000	96	14	78	115	8
BUN (mg/dl)	*.008	64	6	57	73	8
Creatinine (mg/dl)	*.026	1.5	0.2	1.3	1.9	8
Uric Acid (mg/dl)		1.3	0.4	0.8	2.1	8
Sodium (mEq/l)		153	1.	152	155	8
Potassium (mEq/l)		3.3	0.3	3.0	3.7	8
Chloride (mEq/l)		116	2.	112	117	8
Calcium (mg/dl)		10.0	0.4	9.7	10.8	8
Inorganic Phosphates (mg/dl)		3.4	1.0	2.2	4.7	8
BUN/Creatinine	*.000	43.5	4.8	37.9	52.1	8
Serum Iron (µg/dl)	*.000	146.	38	86	204	8
Cholesterol (mg/dl)		318	67	250	453	8
Triglycerides (mg/dl)		24	18	0	54	8
Bilirubin (mg/dl)		0.4	0.2	0.2	0.7	8
SGOT (U/l)	*.001	700	497	381	1870	8
SGPT (U/l)	*.001	622	575	336	2030	8
LDH (U/l)	*.000	1198	399	891	2055	8
Alkaline Phosphatase (U/l)		478	110	313	609	8
Protein (g/dl)	*.000	6.9	0.3	6.2	7.1	8
Albumin (g/dl)		3.9	0.2	3.7	4.3	8
Globulin (g/dl)	*.000	3.0	0.3	2.4	3.4	8
A/G	*.004	1.3	0.2	1.1	1.6	8
CPK (U/l)		74	24	56	121	8
LDH1 (%)	*.005	12	3	9	18	8
LDH2 (%)		27	2	24	31	8
LDH3 (%)		35	3	31	38	8
LDH4 (%)	*.000	23	2	20	27	8
LDH5 (%)		3	2	1	6	8

* = Significantly different from live group

Table 2. Means and standard deviations of plasma constituents from the three Hawaiian spinner dolphins which survived the entire sampling period. Only fresh non-hemolyzed samples are included (For units see Table 1).

Variable	Mean	Standard Deviation	Minimum Value	Maximum Value	N
Glucose	115	16	80	143	16
BUN	60	6	52	73	16
Creatinine	1.6	0.2	1.1	1.9	16
Uric Acid	1.5	0.6	0.8	3.1	16
Sodium	153	2.	149	155	16
Potassium	3.2	0.4	2.6	3.8	16
Chloride	114	1.	112	116	16
Calcium	10.0	0.4	9.5	10.6	16
Inorganic Phosphates	3.0	0.3	2.4	3.4	16
BUN/Creatinine	38.2	4.8	31.1	49.1	16
Serum Iron	107	41	44	184	16
Cholesterol	320	89	225	496	16
Triclycerides	42	32	11	136	16
Total Bilirubin	0.4	0.2	0.1	0.8	16
SGOT	279	68	185	400	16
SGPT	186	47	116	301	16
LDH	724	174	536	1048	16
Alkaline Phosphatase	455	165	262	781	16
Total Protein	7.9	0.6	6.8	8.7	16
Albumin	4.0	0.2	3.7	4.2	16
Globulin	3.8	0.7	2.7	4.8	16
A/G	1.1	0.2	0.8	1.5	16
CPK	96	38	37	191	16
LDH1 (%)	17	7	9	27	16
LDH2 (%)	28	2	23	31	16
LDH3 (%)	34	4	28	41	16
LDH4 (%)	19	4	12	24	16
LDH5 (%)	2	1	1	5	16

Table 3. Means and standard deviations of plasma constituents from frozen spinner dolphin plasma sampled from those animals that survived the entire sampling period. Only non-hemolyzed samples are included. (For units see Table 1).

Variable	Mean	Standard Deviation	Minimum Value	Maximum Value	N
Glucose	116	12	103	143	9
BUN	57	8	48	68	9
Creatinine	1.5	0.3	1.0	1.7	9
Uric Acid	1.1	0.3	0.5	1.5	9
Sodium	150	4.	140	154	9
Potassium	3.2	0.3	2.7	3.6	9
Chloride	114	3	108	118	9
Calcium	9.8	0.3	9.4	10.2	9
Inorganic Phosphates	2.6	1.2	0.0	~~0.5~~ 4.4	9
BUN/Creatinine	39.8	5.4	33.5	48.2	9
Serum Iron	111	53	45	191	9
Cholesterol	308	89	219	526	9
Triglycerides	39	24	11	94	9
Bilirubin	0.3	0.1	0.0	0.5	9
SGOT	251	45	208	332	9
SGPT	91	19	62	118	9
LDH	684	199	474	1031	9
Alkaline Phosphatase	512	179	227	741	9
Protein	7.6	0.6	6.9	8.4	9
Albumin	3.9	0.2	3.6	4.3	9
Globulin	3.7	0.7	2.6	4.5	9
A/G	1.1	0.3	0.9	1.7	9
CPK	88	73	47	278	9
LDH1 (%)	13	6	8	27	9
LDH2 (%)	22	5	17	29	9
LDH3 (%)	41	6	33	54	9
LDH4 (%)	21	6	12	27	9
LDH5 (%)	4	2	1	8	9

Table 4. Means and standard deviations for plasma constituents of spotted dolphin blood. Only non-hemolyzed samples are included (For units see Table 1).

Variable	Mean	Standard Deviation	Minimum Value	Value	N
Glucose	146	36	105	230	17
BUN	64	13	35	91	17
Creatinine	0.9	0.1	0.7	1.1	17
*Uric Acid	0.6	0.3	0.3	1.0	7
Sodium	156	3.	151	160	17
Potassium	2.7	0.4	2.0	3.7	17
Chloride	116	4.	109	121	17
Calcium	8.1	0.4	7.3	8.7	17
Inorganic Phosphates	3.1	0.9	1.3	4.8	17
BUN/Creatinine	69.62	13.93	43.75	93.86	17
Serum Iron	94	21	63	135	17
Cholesterol	170	40	117	282	17
Triglycerides	89	65	13	277	17
Bilirubin	0.3	0.1	0.2	0.5	17
SGOT	281	53	218	399	17
SGPT	105	25	63	163	17
LDH	611	89	461	740	17
Alkaline Phosphatase	352	147	190	765	17
Protein	6.5	0.4	5.9	7.4	17
Albumin	3.6	0.2	3.2	4.0	17
Globulin	2.90	0.35	2.50	3.70	17
A/G	1.26	0.17	1.00	1.54	17
CPK	111	55	28	198	17
LDH1 (%)	9	3	5	16	17
LDH2 (%)	18	4	14	19	17
LDH3 (%)	34	3	27	40	17
LDH4 (%)	24	4	13	30	17
LDH5 (%)	15	2	11	19	17

600 - 7?? 1850 10°?'11"N

1301-STOP. Brailing

DATA FORM FOR CRUISE IV

Date	Set No.	Page
781023	15	1

11°10'N 103°22'W

Activity	Time	No	Species/ Color	Sex	Length	Tag Color, Geom., & No.	Notch No. & Location (Other Marks)	Radio Tag	Tetra. Inject.	Blood	Comments
	1223	1	Spin/Ad	♂	184	NONE					
		2	Sp/Ad	♂	209	OT/087	DNB		20cc		
		3	Spin/Ad	♂	?	NONE	W				RELEASED
		4	Spin/Juv	?	?	NONE	W				RELEASED
		5	Spot/Ad	♂	206	OT/086	H DNB		20cc		
		6	Sp/Mot	♂	165	NONE	W			B-16	Blood taken 1229-1233
		7	Sp/Ad	♀	187	OT/105	H DNB		20cc		
		8	Sp/Mot	♂	175	OT/101	H DNB		20cc		
		9	Sp/Ad	♀	184	OT/103	H DNB		20cc		
	1238	10	Sp/Ad	♀	182	NONE	W			B-15	Blood taken 1234-1238
	1239	11	Sp/Ad	♀	198	OT/118	H DNB		20cc		
		12	Sp/Ad	♂	197	OT/106	H DNB		20cc		
		13	Sp/Ad	♀	189	NONE	W			B-14	Blood taken 1245-
	1245	14	Sp/Sp	♂	153	OT/117	H DNB		15cc		
		~~15~~	~~Sp/Mot~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~H DNB~~		~~20cc~~		~~[illegible]~~
	1301	15	Sp/Ad	♀	180	NONE				B-3	Blood 1258-1301
		16	Spin/Ad	♂	176	NONE	NONE		NONE		
		17	Sp/Sp	♂	156	OT/107	H DNB		20cc		
		18	Sp/Ad	♀	186	OT/108	H DNB		20cc		

10-15 ton + 5 DOI BEFORE B-D

BD 1803 -1815

DATA FORM FOR CRUISE IV 781023 15 ·2

Activity	Time	No	Species/ Color	Sex	Length	Tag Color, Geom., & No.	Notch No. & Location (Other Marks)	Radio Tag	Tetra. Inject.	Blood	Comments
		19	Sp/Ad	♂	209	OT/0104	ONB		25cc		
	1304	20	Sp/Ad	♂	182	OT/0236	ONB		NONE		RECAPTURE
	1308	21	Sp/Ad	♂	185	NONE	W NONE		—	B-4	Blood taken 1305–1308
	1307	22	Sp/Ad	♂	188	OT/0156	H ONB		20cc		
	1309	23	Sp/Mot	♀	174	OT/0109	H ONB		20cc		
		24	Sp/Ad	♀	180	NONE	NONE		NONE	~~[illegible]~~	NO Blood taken ~~[illegible]~~ RELEASED
	1311	25	Sp/Ad	♂	198	OT/0110	H ONB		20cc		
	1313	26	Sp/Mot	♀	174.	OT/0119	H ONB		20cc		
		27	Sp/Ad	♀	183	NONE	W NONE		NONE	B-5	Blood taken 1313–1316
	1315	28	Sp/Ad	♂	200	OT/0112	H ONB		20cc		
		29	Sp/Ad	♀	197	OT/0138	H ONB		20cc		
		30	Sp/Mot.	♀	165	NONE	W NONE		NONE	B-2	Blood taken 1318–1319
		31	Sp/Sp	♂	166	OT/0125	H ONB		20cc		
		32	Sp/Sp	♂	160	OT/0132	H ONB		20cc		
		33	spin	♂	162	NONE	W NONE		NONE		
		34	Sp/Ad	♂	177	NONE	N NONE		NONE	B-13	Blood taken 1323–1327
	1324	35	Sp/Ad	♀	185	OT/137	H ONB		20cc		
	1328	36	Sp/Mot	♀	183	OT/0111	H ONB		20cc		
		37	Sp/Ad	♂	207	OT/0116	H ONB		25cc		

DATA FORM FOR CRUISE IV

Date	Set No.	Page
781023	15	3

Activity	Time	No	Species/ Color	Sex	Length	Tag Color, Geom., & No.	Notch No. & Location (Other Marks)	Radio Tag	Tetra. Inject.	Blood	Comments
		38	Sp/Sp	♀	171	NONE	W NONE		NONE	B-10	Blood taken 1331—1335
	1332	39	Sp Mot	♂	168	OT/0115	H ONB		20cc		
	1335	40	Sp/Ad	♀	186	OT/0122	H ONB		20cc		(↓ APPARENTLY LOST WEIGHT) PLACED DORSAL FIN
		41	Sp/Mot	♂	178	OS/0352	H SNH		NONE		RECAPTURE — TOOK TAG OFF — [illegible]
		42	Sp/Mot	♂	175	NONE	W NONE		NONE	B-9	Blood taken [illegible]
		43	Sp/Ad	♀	175	OT/0150	H ONB		20cc		
		44	Sp/Ad.	♂	197	OT/0164	H ONB		20cc		
	1349	45	Sp/Ad	♀	177	OT/0152	H ONB		20cc		
		46	Sp/Ad	♀	181	OT/0272	H ONB		20cc		
	1354	47	Sp/Ad	♀	194	OT/0181	H ONB		20cc		
	1356	48	Sp/Sp	♀	172	OT/0162	H ONB		20cc		
		49	Sp/Ad	♂	204	NONE	W NONE		NONE	B-12	Blood —1356—1400
	1359	50	Sp/Ad	♀	186	OT/0176	H ONB		20cc		
		51	Sp/Ad	♀	170	NONE	H NONE		NONE		RELEASED — Bone problem in back
	1403	52	Sp/Sp	♀	170	OT/0228	H ONB		20cc		
		53	Sp/Ad	♀	185	NONE	W NONE		NONE	B-11	1401—1405 Blood taken
		54	Sp/Ad	♀	177	OT/0171	H ONB		20cc		
		55	Sp/Ad	♂	180	NONE	W NONE		NONE	~~[illegible]~~	~~[illegible]~~ RELEASED — Bad stress
		56	Sp/Ad	♀	188	OT/0178	H ONB		20cc		

DATA FORM FOR CRUISE IV

Date	Set No.	Page
78023	15	4

Activity	Time	No	Species/ Color	Sex	Length	Tag Color, Geom., & No.	Notch No. & Location (Other Marks)	Radio Tag	Tetra. Inject.	Blood	Comments
	1409	57	Sp/Sp	♀	178	OT/0175	H ONB		20cc		
		58	Sp/Ad	♂	200	NONE	W NONE		NONE	B-6	Blood taken 1409-1412
	1412	59	Sp/Ad	♀	180	OT/0144	H ONB		20cc		
	1414	60	Sp/Sp	♂	162	OT/0147	H ONB		20cc		
		61	Sp/Mot	♀	179	NONE	W NONE		NONE	B-7	Blood taken 1414-1418
	1417	62	Sp/Ad	♀	189	OT/0170	H ONB		20cc		
	1420	63	Sp/TT	♀	124	NONE	H NONE		NONE		RELEASED - TOO SMALL
	1422	64	Sp/Ad	♀	197	NONE	W NONE		NONE	B-8	Blood taken 1419-1422
		65	Sp/Mot	♂	178	OT/0163	H ONB		20cc		
	1425	66	Sp/Ad	♀	185	OT/0153	H ONB		20cc		
	1429	67	Sp/Ad	♀	188	OT/0159	H ONB		20cc		
		68	Sp/Sp	♂	165	OT/0146	H ONB		20cc		
		69	Sp/Mot	♀	176	OT/0179	H ONB		20cc		(ANIMAL SICKLY)
	1439	70	Sp/Sp	♀	173	(DS/0341)	W SNB		20cc		RECAPTURE - TAG REMOVED - CIRCULATION CUT OFF
		71	Sp/Ad	♂	206	NO TAG	H NO DORSAL		20cc		
		72	Sp/Mot	♂	171	OT/0161	H ONB		20cc		
		73	Sp/Ad	♂	179	OT/0258	W ONB		20cc		
		74	Sp/Ad	♂	189	OT/0148	H ONB		20cc		
		75	Sp/TT	♀	127	NONE	NONE		NONE		RELEASED - TOO SMALL

DATA FORM FOR CRUISE IV

Date	Set No.	Page
781023	15	5

Activity	Time	No	Species/ Color	Sex	Length	Tag Color, Geom., & No.	Notch No. & Location (Other Marks)	Radio Tag	Tetra. Inject.	Blood	Comments
	1445	76	Sp/Ad	♀	173	OT/0149	H DNB		20cc		
	1447	77	Sp/Ad	♀	193	OT/0253	W DNB		20cc		
	1447	78	Sp/Sp	♀	160	OT/0143	H DNB		20cc		
		79	Sp/TT	♂	129	OT/0151	H DNB		10cc		
	1452	80	Sp/Ad	♂	192	OT/0268	W DNB		20cc		
		81	Sp/TT	♂	135	NONE	W NONE		NONE		HYPED UP-RELEASED
		82	Sp/Sp	♂	168	OT/0151	H DNB		20cc		
	1455	83	Sp/Ad	♂	191.	OT/0195	W DNB		NONE		RECAPTURE-GOOD SHAPE-#
	1456	84	Sp/Ad	♀	190	OT/0158	H DNB		20cc		
	1458	85	Sp/Ad	♀	197	OT/0264	W DNB		20cc		
		86	Sp/Ad	♂	192	OT/0196	H DNB		20cc		
	1459	87	Sp/TT	♀	130	NONE	N NONE		NONE		RELEASED-TOO SMALL
	1502	88	Sp/Mot	♂	179	OT/0237	W DNB		20cc		
		89	Sp/TT	♂	144	OT/0211	H DNB		15cc		
	1506	90	Sp/Mot	♂	170	OT/0285	W DNB		20cc		
	1505	91	Sp/Ad	♂	193	OT/0213	H DNB		20cc		
	1510	92	Sp/Mot	♂	171	OT/0184	H DNB		15cc		
		93	Sp/Sp	♂	175	OT/0254	W DNB		20cc		
	1512	94	Sp/TT	♀	133	NONE	H NONE		NONE		RELEASED-TOO SMALL

DATA FORM FOR CRUISE IV

Date	Set No.	Page
781023	15	6

Activity	Time	No	Species/ Color	Sex	Length	Tag Color, Geom., & No.	Notch No. & Location (Other Marks)	Radio Tag	Tetra. Inject.	Blood	Comments
	1514	95	Sp/Ad	♀	186	OT/0197	H ONB		20cc		
	1519	96	Sp/TT	♀	154	OT/0191	H DNB		15cc		
	1519	97	Sp/Ad	♀	18.5	OT/0286	W DNB		20cc		
		~~98~~									
		~~99~~									
		~~100~~									

1 2-TONE thrown out end of corral   BD 1114   Skiff up 1223

DATA FORM FOR CRUISE IV

Date 78-10-24 Set No. 16 Page 1   13° .. N 105° 38' W

Activity	RELEASE Time	No	Species/ Color	Sex	Length	Tag Color, Geom., & No.	Notch No. & Location (Other Marks)	Radio Tag	Tetra. Inject.	Blood	Comments
		1	Sp/ Neo	♂	~~188~~ 128	NONE	NONE		NONE		TOO SMALL
	1154	2	Sp/ Ad	♀	196	NONE	W NONE		NONE	B-41	Blood taken 1152-1154
		3	Sp/ Sp	♀	147	OT/0034	H ONB		15cc		
		4	Sp/ Ad	♀	197	NONE	W NONE		NONE	B-17	Blood taken 1156-1201
	1159	5	Sp/ Sp	♀	162	OT/0014	H ONB		20cc		
		6	Sp/ Mot	♀	190	OT/0073	H ONB		20cc		
		7	Sp/ Ad	♀	195	NONE	W NONE		NONE	B-18	Blood taken 1203-1205
	1204	8	Sp/ Ad	♀	185	OT/0019	H ONB		20cc		
	1206	9	Sp/ Ad	♂	203	OT/0043	H ONB		20cc		
		10	Sp/ Ad	♀	192	NONE	W NONE		NONE	B-19	Blood taken - 1206-1210
	1208	11	Sp/ Ad	♀	186	OT/0022	H ONB		20cc		
	1210	12	Sp/ Sp	♀	173	OT/0018	H ONB		20cc		
	1212	13	Sp/ Mot	♂	184	OT/0039	H ONB		20cc		
	1214	14	Sp/ Sp	♀	175	OT/0040	H ONB		20cc		
		15	Sp/ Ad	♂	199	NONE	W NONE		NONE	B-22	Blood taken - 1214-1221
	1217	16	Sp/ Ad	♀	190	OT/0046	H ONB		20cc		
	1220	17	Sp/ Ad	♂	181	OT/0067	H ONB		20cc		
	1223	18	Sp/ Ad	♂	212	OT/0051	H ONB		25cc		
	1226	19	Sp/ Sp	♀	167	OT/0306	H ONB		20cc		

DATA FORM FOR CRUISE IV

Date 78-10-24 Set No. 16 Page 2

Activity	Time	No	Species/ Color	Sex	Length	Tag Color, Geom., & No.	Notch No. & Location (Other Marks)	Radio Tag	Tetra. Inject.	Blood	Comments
		20	Sp/Ad	♀	195	NONE	NONE	W	NONE	B-21	Blood taken 1225-1228
	1229	21	Sp/Mot	♂	173	OT/0030	DNB	H	20cc		
		22	Sp/Ad	♀	195	NONE	NONE	W	NONE		Attempted Blood Failed
	1231	23	Sp/Sp	♀	162	OT/0026	DNB	H	20cc		
		24	Sp/Ad	♀	189	OT/0042	DNB	H	20cc		
		25	SP/Ad	♂	191	OT/052	DNB	H	20cc		
		26	SP/Ad	♀	190	None	None	W	None	B-20	Blood taken 1237-1240
	1239	27	SP/SP	♂	162	OT/009	DNB	H	20cc		
		28	SP/Ad	♀	188	OT/015	DNB	H	20cc		
		29	SP/Ad	♂	199	None	none	W	None	B24	Blood Taken 1242 - 1243
		30	SP/Ad	♀	194	OT/008	DNB	H	20cc		
		31	SP/Ad	♂	194	None	None	W	None	B-25	Blood Taken 1245 - 1247
		32	SP/Ad	♀	172	OT/010	DNB	H	20cc		
		33	SP/++	♀	132	OT/037	DNB	H	10cc		
		34	SP/Mot	♀	187	None	None	W	None	B-27	Blood taken 1251 - 1253
		35	SP/Ad	♀	185	OT/025	DNB	H	20cc		
		36	SP/Ad	♂	209	None	none	W	None	B-26	Blood Taken 1256 - 1300
	1257	37	SP/Ad	♂	172	OT/031	DNB	H	20cc		
		38	SP/SP	♀	177	OT/035	DNB	H	20cc		

DATA FORM FOR CRUISE IV

Date: 781024 Set No.: 16 Page: 3

Activity	Time	No	Species/ Color	Sex	Length	Tag Color, Geom., & No.	Notch No. & Location (Other Marks)	Radio Tag	Tetra. Inject.	Blood	Comments
		39	SP/Ad	♀	185	None	None	W	None	B-30	Blood taken 1301-1303
		40	SP/Mot	♂	173	OT/221	DNB	H	20cc		
	1301	41	SP/SP	♂	172	OT/190	DNB	H	20cc		
		42	SP/Ad	♂	198	OT/193	DNB	H	20cc		
		43	SP/Mot	♀	168	None	None	W	None	B-28	Blood taken 1310-1312
		44	SP/Ad	♂	183	OT/216	DNB	H	20cc		
		45	SP/Ad	♀	193	OT/227	DNB	H	20cc		
		46	SP/Ad	♂	198	None	None	W	None	B-23	Blood taken 1315-1317
		47	SP/Ad	♂	186	None	None	W	None	B-29	Blood taken 1318-1319
		48	SP/Mot	♂	161	OT/185	DNB	H	20cc		
		49	SP/Mot	♂	165	None	None	W	None	B-35	Blood taken 1320-1322
		50	SP/Ad	♂	198	OT/215	DNB	H	20cc		
		51	SP/Mot	♀	175	None	None	W	None	B-37	Blood taken 1327-1312
		52	SP/++	♂	156	OT/210	DNB	H	15cc		
	1331	53	SP/Ad	♂	201	OT/200	DNB	H	20cc		
	1333	54	SP/Ad	♂	195	OT/186	DNB	H	20cc		
		55	SP/Ad	♂	192	OT/203	DNB	H	20cc		
		56	SP/SP	♂	171	OT/224	DNB	H	20cc		
		57	SP/Mot	♂	199	OT/220	DNB	H	20cc		

DATA FORM FOR CRUISE IV

Date	Set No.	Page
781024	16	4

Activity	Time	No	Species/ Color	Sex	Length	Tag Color, Geom., & No.	Notch No. & Location (Other Marks)	Radio Tag	Tetra. Inject.	Blood	Comments
		58	SP/ Ad	♂	187	OT/223	DNB	H	20cc		
		59	SP/ Ad	♂	190	None	None	W	None	B-34	Blood taken 1350-1356
	1354	60	SP/ Y	♂	151	OT/225	DNB	H	15cc		
		61	SP/ Ad	♂	202	OT/194	DNB	H	20cc		
		62	SP/ Ad	♀	175	None	None	W	None	B-31	Blood taken 1357-1400
	1400	63	SP/ Ad	♂	187	OT/209	DNB	H	20cc		
		~~64~~									
		~~65~~									

!R2 TOMC

CHAR3 SAMPLE	DATE	TIME CAPTURED	GLUCOSE	UREA N	CREATININE
DDB 009	781023	1335-1356	154	61.0	.7
	× 16	1229	109	77.0	1.1
	× 15	1234	99	70.0	1.1
	14	1245	128	73.0	.7
	03	1258	153	73.0	.8
	04	1305	109	65.0	.7
	05	1313	130	60.0	1.1
	02	1318	137	53.0	.9
	13	1323	153	65.0	.9
	10	1331	160	68.0	.9
	12	1356	171	53.0	.9
	11	1401	129	68.0	1.0
	06	1409	129	62.0	.9
	07	1414	147	54.0	.8
	08	1419	139	63.0	1.0
41	781024	1150	99	95.0	.9
	17	1156	90	75.0	.9
	18	1203	145	79.0	1.0
	19	1206	158	91.0	1.0
	22	1214	157	58.0	1.0
	21	1225	126	71.0	.9
	20	1237	158	58.0	.8
	24	1242	131	73.0	1.0
	25	1245	126	61.0	1.0
	27	1251	109	74.0	1.1
	26	1256	136	79.0	1.2
	30	1301	227	58.0	1.1
	28	1310	105	56.0	.9
	23	1315	230	56.0	.8
	29	1318	141	35.0	.8
	35	1320	171	52.0	.8
	37	1327	176	56.0	.9
	34	1350	166	59.0	1.0
	31	1357	160	61.0	1.1
WES	771130	1404	178	59.0	1.5
	771201	1124	164	72.0	1.4
			154	79.0	1.7
	771209	1610	122	63.0	1.5
	771211	1248	100	68.0	1.6
	771213	1212	120	78.0	1.8
			122	71.0	1.2
			134	68.0	1.2
	771217	1311	111	62.0	1.3
			87	64.0	1.0

Set 1

Set 2

Ignore these

W

URIC ACID	SODIUM	POTASSIUM	CHLORIDE	CALCIUM	INORG PHOSPHATES
	156.0	3.8	116.0	8.6	4.7
	160.0	3.4	116.0	8.6	4.8
		3.2	119.0	8.4	3.8
	160.0	3.2	117.0	7.8	3.3
.7	159.0	3.1	116.0	8.3	4.0
.4	151.0	2.6	110.0	7.3	3.3
.3	155.0	3.0	118.6	7.4	3.5
.4	154.0	2.9	116.0	7.3	2.4
	157.0	3.8	117.0	8.0	4.6
	157.0	3.8	119.0	7.8	3.1
	157.0	3.5	114.0	8.0	3.6
	158.0	3.8	116.0	8.6	3.6
	156.0	3.6	118.0	7.4	2.1
	152.0	2.7	115.0	7.8	2.2
second set →		3.2	126.0	8.4	3.0
	155.0	2.9	114.0	7.8	4.0
	158.0	2.9	114.0	8.3	3.6
1.0	159.0	2.5	114.0	8.2	3.0
.8	159.0	2.8	119.0	8.0	3.8
.5	154.0	2.5	113.0	8.2	2.0
1.7	156.0	2.8	118.0	8.4	4.0
.5	155.0	2.4	112.0	7.6	2.6
	159.0	2.5	114.0	8.4	3.0
	159.0	2.8	119.0	8.6	3.2
	158.0	2.6	121.0	8.2	4.6
	158.0	3.0	120.0	8.5	3.7
	156.0	2.0	120.0	8.1	1.3
	154.0	2.9	115.0	8.2	2.9
	154.0	2.3	111.0	8.1	2.6
	153.0	2.4	109.0	8.4	2.5
	155.0	2.7	115.0	8.7	3.0
	153.0	2.4	112.0	8.4	1.8
	158.0	3.7	119.0	8.7	3.4
	158.0	3.7	119.0	8.7	2.4
1.1	157.0	6.6	119.0	6.1	7.2
1.2	152.0	5.2	116.0	7.9	5.0
.8	150.0	4.1	119.0	8.7	5.6
1.2	156.0	4.9	118.0	9.3	5.8
.7	141.0	6.3	111.0	8.3	5.0
1.7		5.0	114.0	10.1	5.1
.8	154.0	5.2	123.0	8.0	4.4
.7	153.0	4.6	118.0	8.6	3.8
1.5	150.0	5.6	118.0	8.3	6.0
1.5	136.0	6.0	116.0	7.1	4.9

BUN CREATININE	SERUM IRON	CHOLESTEROL	TRIGLYCERIDES
87.14	117.0	217.0	180.0
70.00	104.0	194.0	277.0
63.64	90.0	218.0	140.0
104.29	136.0	151.0	86.0
91.25	134.0	187.0	108.0
92.86	91.0	177.0	65.0
54.55	90.0	119.0	51.0
58.89	63.0	157.0	138.0
72.22	99.0	158.0	38.0
75.56	112.0	200.0	141.0
58.89	155.0	226.0	109.0
68.00	120.0	201.0	73.0
68.89	108.0	278.0	999.0
67.50	93.0	282.0	115.0
63.00	99.0	212.0	103.0
105.56	143.0	203.0	362.0
83.33	110.0	192.0	181.0
79.00	110.0	166.0	80.0
91.00	98.0	191.0	168.0
58.00	83.0	153.0	26.0
78.89	106.0	181.0	96.0
72.50	135.0	188.0	75.0
73.00	120.0	133.0	70.0
61.00	93.0	213.0	133.0
67.27	82.0	134.0	14.0
65.83	100.0	183.0	84.0
52.73	77.0	117.0	13.0
62.22	71.0	136.0	59.0
70.00	80.0	159.0	78.0
43.75	71.0	174.0	57.0
65.00	95.0	142.0	28.0
62.22	94.0	130.0	41.0
59.00	81.0	155.0	18.0
55.46	103.0	145.0	24.0
39.33	163.0	170.0	71.0
51.43	145.0	165.0	99.0
46.47	180.0	172.0	60.0
42.00	122.0	165.0	51.0
43.96	174.0	248.0	78.0
54.81	126.0	218.0	113.0
59.17	133.0	166.0	185.0
58.30	175.0	158.0	200.0
50.08	158.0	181.0	152.0
65.56	208.0	312.0	230.0

TOTAL BILIRUBIN	SGOT	SGPT	LDH TOTAL	ALKA PHOSPHATASE
.2	262.0	97.0	581.0	570
.3	274.0	102.0	486.0	223
.2	309.0	108.0	539.0	212
.3	331.0	147.0	532.0	284
.3	389.0	117.0	710.0	357
.2	225.0	79.0	492.0	353
.3	218.0	63.0	461.0	276
.3	+335.0	+135.0	+680.0	−256
.3	326.0	163.0	311.0	388
.2	272.0	113.0	569.0	416
.4	235.0	86.0	420.0	380
.3	342.0	143.0	690.0	318
.5	249.0	124.0	496.0	335
.3	399.0	163.0	680.0	394
.3	258.0	102.0	571.0	230
.2	150.0	105.0	680.0	245
.2	299.0	130.0	820.0	333
.5	272.0	100.0	725.0	190
.2	251.0	115.0	509.0	201
.5	247.0	124.0	810.0	499
.1	236.0	37.0	840.0	332
.3	269.0	96.0	587.0	278
.2	311.0	134.0	640.0	205
.3	278.0	110.0	700.0	450
.2	218.0	65.0	583.0	765
.2	243.0	136.0	840.0	297
.4	271.0	100.0	650.0	352
.2	248.0	89.0	585.0	547
.2	281.0	107.0	599.0	274
.2	249.0	101.0	740.0	450
.4	228.0	117.0	800.0	887
.3	200.0	170.0	790.0	487
.2	297.0	103.0	557.0	420
.3	302.0	146.0	850.0	402
.2	282.0	64.0		
.3	330.0	84.0		403
.2	224.0	37.0		212
.4	222.0	36.0		436
.4				138
.1	237.0	33.0		192
.2	254.0	71.0		431
.4	259.0	59.0		154
.1	239.0	76.0		252
.1	232.0	74.0	62.0	100

TOTAL PROTEIN	ALBUMIN	GLOBULIN	A G	MYOGLOBIN	CPK
6.7	3.4	3.30	1.03		28
6.3	3.7	2.60	1.42		61
6.7	3.8	2.90	1.31		154
5.7	3.6	2.10	1.71		161
6.4	3.8	2.60	1.46		193
7.1	3.6	3.50	1.03		96
5.9	3.2	2.70	1.19		139
+ 6.8	− 3.4	+ 3.40	− 1.00		+ 187
6.9	3.7	3.20	1.16		61
5.4	3.2	2.20	1.45		42
6.7	3.6	3.10	1.16		33
6.2	3.9	2.30	1.70		81
6.2	3.4	2.80	1.21		54
6.3	3.8	2.50	1.52		179
5.7	3.2	2.50	1.28		114
6.7	3.3	3.40	.97		9
7.4	3.8	3.60	1.06		261 –
6.8	3.7	3.10	1.19		28
6.5	3.6	2.90	1.24		75
6.7	3.3	3.40	.97		51
6.7	3.6	3.10	1.16		28
6.1	3.4	2.70	1.26		87
7.4	3.7	3.70	1.00		61
6.3	3.5	2.80	1.25		70
6.4	3.7	2.70	1.37		73
7.9	3.5	4.40	.80		70
6.3	3.6	2.70	1.33		79
6.4	3.6	2.80	1.29		88
6.7	3.6	3.10	1.16		198
6.6	4.0	2.60	1.54		98
6.6	3.7	2.90	1.28		61
6.6	3.9	2.70	1.44		19
6.5	3.6	2.90	1.24		173
6.3	4.0	2.30	1.74		98
5.8	4.3	1.50	2.87		186
6.6	4.1	2.50	1.64		130
6.2	3.7	2.45	1.51		67
6.6	4.0	2.50	1.60		70
6.6	4.6	2.00	2.29		28
7.0	4.3	2.63	1.64		18
5.3	3.9	1.43	2.76		74
7.8	4.3	3.47	1.24		60
6.9	4.3	2.43	2.30		42
7.2	3.7	3.10	1.22		9

BUN CREATININE	SERUM IRON	CHOLESTEROL	TRIGLYCERIDES
87.14	117.0	217.0	180.0
70.00	104.0	194.0	277.0
63.64	90.0	218.0	140.0
104.29	136.0	151.0	86.0
91.25	134.0	187.0	108.0
92.86	91.0	177.0	65.0
54.55	90.0	119.0	51.0
58.89	63.0	157.0	138.0
72.22	99.0	158.0	38.0
75.56	112.0	200.0	141.0
58.89	155.0	226.0	109.0
68.00	120.0	201.0	73.0
68.89	108.0	278.0	999.0
67.50	93.0	282.0	115.0
63.00	99.0	212.0	103.0
105.56	143.0	203.0	362.0
83.33	110.0	192.0	181.0
79.00	110.0	166.0	80.0
91.00	98.0	191.0	168.0
58.00	83.0	153.0	26.0
78.89	106.0	181.0	96.0
72.50	135.0	188.0	75.0
73.00	120.0	133.0	70.0
61.00	93.0	213.0	133.0
67.27	82.0	134.0	14.0
65.83	100.0	183.0	84.0
52.73	77.0	117.0	13.0
62.22	71.0	136.0	59.0
70.00	80.0	159.0	78.0
43.75	71.0	174.0	57.0
65.00	95.0	142.0	28.0
62.22	94.0	130.0	41.0
59.00	81.0	155.0	18.0
55.46	103.0	145.0	24.0
39.33	163.0	170.0	71.0
51.43	145.0	165.0	99.0
46.47	180.0	172.0	60.0
42.00	122.0	165.0	51.0
43.96	174.0	248.0	78.0
54.81	126.0	218.0	113.0
59.17	133.0	166.0	185.0
58.30	175.0	158.0	200.0
50.08	158.0	181.0	152.0
65.56	208.0	312.0	230.0

TOTAL BILIRUBIN	SGOT	SGPT	LDH TOTAL	ALKA PHOSPHATASE
.2	262.0	97.0	581.0	570
.3	274.0	102.0	486.0	223
.2	309.0	108.0	539.0	212
.3	331.0	147.0	532.0	284
.3	389.0	117.0	710.0	357
.2	225.0	79.0	492.0	353
.3	218.0	63.0	461.0	276
.3	+335.0	+135.0	+680.0	—256
.3	326.0	163.0	311.0	388
.2	272.0	113.0	569.0	416
.4	235.0	86.0	420.0	380
.3	342.0	143.0	690.0	318
.5	249.0	124.0	496.0	335
.3	399.0	163.0	680.0	394
.3	258.0	102.0	571.0	230
.2	150.0	105.0	680.0	245
.2	299.0	130.0	820.0	333
.5	272.0	100.0	725.0	190
.2	251.0	115.0	509.0	201
.5	247.0	124.0	810.0	499
.1	236.0	37.0	840.0	332
.3	269.0	96.0	587.0	278
.2	311.0	134.0	640.0	205
.3	278.0	110.0	700.0	450
.2	218.0	65.0	583.0	765
.2	243.0	136.0	840.0	297
.4	271.0	100.0	650.0	352
.2	248.0	89.0	585.0	547
.2	281.0	107.0	599.0	274
.2	249.0	101.0	740.0	450
.4	228.0	117.0	800.0	887
.3	200.0	170.0	790.0	487
.2	297.0	103.0	557.0	420
.3	302.0	146.0	850.0	402
.2	282.0	64.0		
.3	330.0	84.0		403
.2	224.0	37.0		212
.4	222.0	36.0		436
.4				138
.1	237.0	33.0		192
.2	254.0	71.0		431
.4	259.0	59.0		154
.1	239.0	76.0		252
.1	232.0	74.0	62.0	100

TOTAL PROTEIN	ALBUMIN	GLOBULIN	A G	MYOGLOBIN	CPK
6.7	3.4	3.30	1.03		28
6.3	3.7	2.60	1.42		61
6.7	3.8	2.90	1.31		154
5.7	3.6	2.10	1.71		161
6.4	3.8	2.60	1.46		193
7.1	3.6	3.50	1.03		96
5.9	3.2	2.70	1.19		139
+ 6.8	− 3.4	+ 3.40	− 1.00		+ 187
6.9	3.7	3.20	1.16		61
5.4	3.2	2.20	1.45		42
6.7	3.6	3.10	1.16		33
6.2	3.9	2.30	1.70		81
6.2	3.4	2.80	1.21		54
6.3	3.8	2.50	1.52		179
5.7	3.2	2.50	1.28		114
6.7	3.3	3.40	.97		9
7.4	3.8	3.60	1.06		261
6.8	3.7	3.10	1.19		28
6.5	3.6	2.90	1.24		75
6.7	3.3	3.40	.97		51
6.7	3.6	3.10	1.16		28
6.1	3.4	2.70	1.26		87
7.4	3.7	3.70	1.00		61
6.3	3.5	2.80	1.25		70
6.4	3.7	2.70	1.37		73
7.9	3.5	4.40	.80		70
6.3	3.6	2.70	1.33		79
6.4	3.6	2.80	1.29		88
6.7	3.6	3.10	1.16		198
6.6	4.0	2.60	1.54		98
6.6	3.7	2.90	1.28		61
6.6	3.9	2.70	1.44		19
6.5	3.6	2.90	1.24		173
6.3	4.0	2.30	1.74		98
5.8	4.3	1.50	2.87		186
6.6	4.1	2.50	1.64		130
6.2	3.7	2.45	1.51		67
6.6	4.0	2.50	1.60		70
6.6	4.6	2.00	2.29		28
7.0	4.3	2.63	1.64		18
5.3	3.9	1.43	2.76		74
7.8	4.3	3.47	1.24		60
6.9	4.3	2.43	2.30		42
7.2	3.7	3.10	1.22		9

CPK1	CPK2	CPK3	LDH1	LDH2	LDH3	LDH4
18	10		15	32	32	12
15	46		16	29	29	13
117	37		15	25	35	13
100	61		17	25	29	17
115	78		6	15	34	26
88	8		11	17	32	29
108	31		5	16	36	27
+168	−19		−5	−18	+40	23
39	22		11	18	37	22
32	10		15	32	36	14
24	9		11	30	34	15
60	21		16	27	35	16
30	24		4	16	32	35
154	25		6	17	37	26
87	27		5	17	37	24
7	2		9	19	36	22
135	126		7	15	39	27
20	8		7	18	33	30
55	20		7	14	38	24
45	6		7	20	33	23
20	8					
60	27		8	20	36	25
55	6		7	20	34	27
65	5		7	16	38	24
60	13		10	14	35	24
25	45		8	14	39	26
65	14		12	18	30	23
70	18		13	17	33	20
105	93		10	16	33	26
55	43		10	21	35	20
60	1		8	18	31	24
10	9		8	20	28	26
120	53		14	14	27	27
65	33		10	17	30	27
115	71		5	17	38	26
90	40		7	18	34	27
40	27		6	18	34	27
50	20		15	15	32	25
21	7		4	18	36	30
10	8		9	11	37	26
30	44		10	15	32	26
10	50		8	17	35	27
15	27		8	18	33	26
9	0		8	17	33	30

LDH5

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