

Table S1. Case 1: Hematology and biochemistry results in subantarctic fur seal (*Arctocephalus tropicalis*).

Parameters	03/15/2016	04/13/2016	04/28/2016	05/31/2016	Reference Values
HEMATOLOGY					
RBCs (/mm ³)	2.42	2.82	3.39	7.50	4.02–6.6^a
Hemoglobin (g/dL)	6.1	8.7	9.8	13.6	11.5–18.9^a
Hematocrit (%)	21.8	22.0	30.2	55.0	36–60^a
MCV (u ³)	90.1	78.0	89.1	73.3	87.48–95.2^a
MCH (pg)	25.2	30.9	28.9	18.1	29.52–32.43^a
MCHC (g/dL)	28.0	39.5	32.5	24.7	31.0–34.36^a
RDW (%)	13.8	18.1	15.3	13.7	-
Plasma proteins (g/dL)	8.8	9.0	9.6	9.4	-
Eritroblasts (%)	1184	536	193	48	-
Hematozoan examination (blood smear)	Negative	NE	Negative	Negative	
WBC (/mm ³)	2.7	3.7	8.5	14.6	10.6–26.6^b
Band neutrophils (/mm ³)	0	0.037 (1%)	0.17 (2%)	0	100–2000^b
Segmented neutrophils (/mm ³)	2,052 (76%)	3,071 (83%)	6,885 (81%)	11,680 (80%)	5100–16,000^b
Eosinophils (/mm ³)	0.216 (8%)	0	0.085 (1%)	0	100–8,200^b
Basophils (/mm ³)	0	0	0.17 (2%)	0	0^b
Lymphocytes (/mm ³)	0.324 (12%)	0.44 (12%)	0.51 (6%)	2.92 (20%)	1,100–12,500^b
Monocytes (/mm ³)	0.108 (4%)	0.148 (4%)	0.68 (8%)	0	100–800^b
Platelets (/mm ³)	885	269	235	406	190–400^c
SERUM CHEMISTRY					

Urea nitrogen (mg/dL)	77.7	135.7	82.6	62.8	53–110^a
Creatinine (mg/dL)	1.28	1.60	0.88	0.85	0.40–1.31^a
AST (GOT) (U/L)	100.0	31.0	38.0	57.0	20–83^a
ALT (TGP) (U/L)	6	10	15	21	10–117^a
GGT (U/L)	134	143	243	121	27–217^a
Alkaline phosphatase (U/L)	85	60	78	76	73–168^a
Total CK (U/L)	40	NE	NE	282	54.2–424^a
Total proteins (g/dL)	7.3	7.6	7.5	8.3	6.25–7.45^a
Albumin (g/dL)	4.1	3.8	4.1	3.7	2.02–4.07^a
Globulin (g/dL)	3.20	3.80	3.40	4.60	3.1–4.9^c
Calcium (mg/dL)	10.2	10.0	10.0	10.2	6.88–9.34^a
Phosphorus (mg/dL)	8.45	8.83	7.21	6.26	2.74–15.89
Sodium (mmol/L)	139.1	135.7	149.0	149.3	134–152^a
Potassium(mmo/L)	5.23	4.77	5.26	4.79	4.4–5.3^a
Chloride (mmo/L)	NE	102.00	108.50	106.30	105–113^c
Triglycerides (mg/dL)	110.0	186.5	116.1	44.0	13–94^a
Total cholesterol (mg/dL)	431	440	461	288	71–353^a
Total bilirubin (mg/dL)	0.37	0.20	0.34	0.13	0.13–0.38^a
Direct bilirubin (mg/dL)	0.17	0.20	0.20	0.07	0.01–0.26^a
Indirect bilirubin (mg/dL)	0.20	0	0.14	0.06	0.02–0.29^a
Lipase (U/L)	4447	3256	3990	4324	86–278^c
Amylase (U/L)	355	214	251	331	1–7^c
Glucose (mg/dL)	167.7	126.6	186.0	146.5	70–174^a

NE: not evaluated; RBC: Red blood cell count; WBC: White blood cell count; MCV: mean corpuscular volume; MCH: mean corpuscular hemoglobin; MCHC: mean corpuscular hemoglobin concentration; RDW: red blood cell distribution width; AST: aspartate aminotransferase or serum-glutamic-oxaloacetic transaminase; ALT: alanine aminotransferase or serum glutamic-pyruvic transaminase (SGPT); GGT: gamma-glutamyltranspeptidase; CK: creatine kinase/phosphokinase or phosphocreatine kinase.

^a Ruoppolo V, Loureiro JD. Carnivora- Otariidae, Phocidae (Foca, Lobo-marinho, Elefante-marinho) (2014). In: Cubas ZS, Silva JCR, Catão-Dias JL. Tratado de animais selvagens. São Paulo, Roca, p 893-916.

^b Seguel M, Muñoz F, Keenan A, Perez-Venegas DJ, DeRango E, Paves H, Gottdenker N, Müller A (2016) Hematology, Serum Chemistry, and Early Hematologic Changes in Free-Ranging South American Fur Seals (*Arctocephalus australis*) at Guafo Island, Chilean Patagonia. J Wildl Dis 52:663-668.

^c Bossart GD, Reidarson TH, Dierauf LA and Duffield DA (2001). Clinical Pathology (Chapter 19). In: Dierauf LA and Gulland MDF. (Eds.). CRC Handbook of Marine Mammal Medicine, 2nd edition. Section IV, Pathology of Marine Mammals, p 383-430.

Table S2. Case 2: Hematology and biochemistry results in subantarctic fur seal (*Arctocephalus tropicalis*).

Parameters (units) / Date	12/09/2019	01/23/2020	03/11/2020	03/30/2020	04/08/2020	04/28/2020	05/20/20	06/10/2020	07/18/20	Reference values
HEMATOLOGY										
RBCs (/mm ³)	4.44	4.41	2.62	1.93	2.63	3.96	4.49	3.36	1.85	4.02 – 6.6 ^a
Hemoglobin (g/dL)	14	14	6.7	4.7	6.3	8.8	10	7.7	3.8	11.5 – 18.9 ^a
Hematocrit (%)	49.3	43.5	22.3	15.2	18.3	25.8	32	24	11	36 – 60 ^a
MCV (fl)	111	98.6	85.1	78.8	69.6	65.2	71.3	71.4	60	87.48 – 95.24 ^a
MCH (pg)	31.5	31.7	25.6	24.4	24	22.2	22.3	22.9	20.5	29.52 – 32.43 ^a
MCHC (g/dL)	28.4	32.2	30	30.9	34.4	34.1	31.3	32.1	34.2	31.0 – 34.36 ^a
RDW (%)	11.8	14.9	NE	23.6	23.6	25.8	21	19.6	27.2	-
Plasma proteins (g/dL)	7.2	8.6	8.6	9.6	10.4	10.6	10.6	9.2	9.6	-
Erythroblasts (%)	0	36	508	250	38	26	20	0	15	-
Hematozoan examination (blood smear)	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative	-
WBCs (/mm ³)	4.8	5.9	2.0	3.1	8.7	7.9	7.8	9.2	4.3	10.6 – 26.6 ^b
Band neutrophils (/mm ³)	0	0	0	31	0	0	0	78	0	100 – 2000 ^b
Segmented neutrophils (/mm ³)	3,552	5,015	1,040	1,984	7,917	5,925	6,552	8,832	3,870	5,100 – 16,000 ^b
Eosinophils (/mm ³)	0	0	0	62	0	0	0	0	0	100 – 8,200 ^b
Basophils (/mm ³)	0	0	0	0	0	0	0	0	0	0 ^b
Lymphocytes (/mm ³)	1,152	767	880	744	435	1,501	858	184	86	1,100 – 12,500 ^b
Monocytes (/mm ³)	96	118	80	279	348	474	312	184	258	100 – 800 ^b
Platelets (/mm ³)	305	697	747	168	759	747	736	825	247	190 – 400 ^c
Fibrinogen (mg/dl)	200	400	600	NE	800	400	NE	200	NE	151-321 ^c

SERUM CHEMISTRY										
Urea nitrogen (mg/dL)	67.8	74.6	97.4	NE	NE	78.5	NE	86.7	NE	53 – 110^a
Creatinine (mg/dL)	0.53	0.9	0.72	NE	NE	0.98	NE	0.9	NE	0.40 – 1.31^a
AST (GOT) (U/L)	49	96	59	NE	NE	139	NE	72	NE	20– 83^a
ALT (TGP) (U/L)	26	43	27	NE	NE	40	NE	49	NE	10 – 117^a
GGT (U/L)	232	267	153	NE	NE	388	NE	270	NE	27 – 217^a
Alkaline phosphatase (U/L)	95	76	71	NE	NE	132	NE	110	NE	73 – 168^a
CK (U/L)	176	NE	1681	NE	NE	NE	NE	NE	NE	54.2 – 424^a
Total protein (g/dL)	6.48	7.81	7.39	NE	7.99	9.19	NE	7.74	9.6	6.25 – 7.45^a
Albumin (g/dL)	3.59	4.37	4.26	NE	4.62	5.26	NE	4.44	NE	2.02 – 4.07^a
Globulin (g/dL)	2.89	3.44	3.13	NE	3.37	3.93	NE	3.3	NE	3.1 – 4.9^c
Calcium (mg/dL)	9.7	11.4	11.4	NE	NE	NE	NE	NE	NE	6.88 – 9.34^a
Phosphorus (mg/dL)	6.31	6.78	9.36	NE	NE	8.41	NE	NE	NE	2.74 – 15.89^a
Sodium (mmol/L)	149.7	156.4	153.7	NE	NE	148.11	NE	NE	NE	134 – 152^a
Potassium (mmo/L)	4.55	4.89	6.22	NE	NE	5.25	NE	NE	NE	4.4 – 5.3^a
Chloride (mmo/L)	116.5	112.6	115	NE	NE	107.4	NE	NE	NE	105 – 113^c
Triglycerides (mg/dL)	64.6	223	2	66.9	NE	NE	159.6	NE	NE	13 – 94^a
Total cholesterol (mg/dL)	190	292	323	NE	NE	679	NE	472	NE	71 – 353^a
Total bilirubin (mg/dL)	0.87	0.5	0.34	NE	NE	0.46	NE	0.12	NE	0.13 – 0.38^a
Direct bilirubin (mg/dL)	0.84	0.49	0.24	NE	NE	0.44	NE	0.1	NE	0.01 – 0.26^a
Indirect bilirubin (mg/dL)	0.03	0.01	0.1	NE	NE	0.02	NE	0.02	NE	0.02 – 0.29^a
Lipase (U/L)	2,513	3,568	3,682	NE	NE	1,185	NE	NE	NE	86 – 278^c
Amylase (U/L)	39	54	70	NE	NE	71	NE	NE	NE	1 – 7^c

Glucose (mg/dL)	123.9	95.7	146	NE	NE	113	122.5	113.1	NE	70 – 174^a
Iron (ug/dl)	81.6	NE	105.4	NE	NE	NE	NE	NE	NE	69 – 97^a

NE: not evaluated; RBC: Red blood cell count; WBC: White blood cell count; MCV: mean corpuscular volume; MCH: mean corpuscular hemoglobin; MCHC: mean corpuscular hemoglobin concentration; RDW: red blood cell distribution width; AST: aspartate aminotransferase or serum-glutamic-oxaloacetic transaminase; ALT: alanine aminotransferase or serum glutamic-pyruvic transaminase (SGPT); GGT: gamaglutamiltranspeptidase; CK: creatine kinase/phosphokinase or phosphocreatine kinase.

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^c Bossart GD, Reidarson TH, Dierauf LA and Duffield DA (2001). Clinical Pathology (Chapter 19). In: Dierauf LA and Gulland MDF. (Eds.). CRC Handbook of Marine Mammal Medicine, 2nd edition. Section IV, Pathology of Marine Mammals, p 383-430.

Table S3. Complementary exams of Case 1.

Date	Test	Sample	Pathogen	Results
At stranding (August 2008). Additionally, on admission (March 2015) and then periodically during preventive (annual) exams at Aquário de São Paulo	Serology ¹	Serum	<i>Brucella</i> spp., <i>Leptospira</i> spp., <i>Toxoplasma gondii</i>	Negative
On admission (March 2015) and then periodically during preventive (annual) exams at Aquário de São Paulo	PCR/reverse transcriptase PCR ¹	Fezes	Canine enteric coronavirus, Canine circovirus, <i>Campylobacter jejuni</i> , <i>Clostridium perfringens</i> enterotoxin A, <i>Salmonella</i> sp., <i>Cryptosporidium</i> sp., <i>Giardia</i> sp.,	+ to <i>Clostridium perfringens</i> enterotoxin A
	Real time PCR ¹	Fezes	Canine parvovirus, <i>Campylobacter coli</i>	Negative
	Real time PCR ¹	Fezes, nasal and ocular secretion	Canine distemper	Negative

Abril 2016, during treatment and medical management of an episode of poor appetite	Fecal culture ¹	Fezes	<i>Campylobacter coli</i> , <i>Campylobacter jejuni</i>	Negative
<i>Postmortem</i>	Culture for aerobic bacteria ^{1,2}	Skin	<i>Acinetobacter baumannii</i> , <i>Pseudomonas putida</i>	Negative
<i>Postmortem</i>	PCR ³	FFPE tissues	Herpesvirus	Negative

Notes= Positive results marked in bold. ¹Exam was performed by an external commercial laboratory. ²Automated method (Phoenix-BD). ³PCR for DNA polymerase and glycoprotein B1 genes (VanDevanter et al. [1996] and Ehlers et al., [2008]). FFPE tissues= formalin-fixed paraffin-embedded tissues.

Table S4. Complementary exams of Case 2.

Date	Test	Sample	Pathogen	Results
At rehabilitation center (October 2019) and on admission (December 2019) and repeated at the end of quarantine (January 2020).	Serology (HA)	Serum	<i>Brucella</i> spp., <i>Leptospira interrogans</i> , <i>Toxoplasma gondii</i>	Negative
On admission (December 2019) and repeated at the end of quarantine (January 2020) and then periodically during preventive (annual) exams at Aquário de São Paulo. Additionally, on admission (March 2015) and then periodically during preventive (annual) exams at Aquário de São Paulo	Real time PCR	Feces	Canine distemper virus, Canine enteric coronavirus, Canine circovirus, Canine parvovirus, <i>Campylobacter coli</i> , <i>Campylobacter jejuni</i> , <i>Salmonella</i> sp., <i>Clostridium perfringens</i> (enterotoxin A) , <i>Cryptosporidium</i> sp., <i>Giardia</i> sp.,	+ to <i>Clostridium perfringens</i> (enterotoxin A) ,
	Real time reverse transcriptase PCR ¹	Nasal and ocular secretion	Canine distemper virus	Negative
	Real time PCR ¹	Urine	<i>Leptospira</i> sp.	Negative
When hemolytic anemia was diagnosed	Real time PCR ¹	Whole Blood	<i>Anaplasma platys</i> , <i>Bartonella</i> sp., <i>Ehrlichia canis</i> , <i>Mycoplasma</i> sp., <i>Mycoplasma haemocanis</i> ,	Negative

				<i>Neorickettsia ristici</i> , <i>Rickettsia rickettsi</i> , <i>Babesia</i> sp., <i>Hepatozoon canis</i> , <i>Leishmania</i> sp., <i>Rangelia vitalli</i>
<i>Postmortem</i>	PCR ²	Frozen tissues	Herpesvirus	gB was amplified in spleen and lung

Notes = Positive results marked in bold. ¹Exam performed by an external commercial laboratory. ²PCR for DNA polymerase and glycoprotein B1 genes (VanDevanter et al. [1996] and Ehlers et al., [2008]).

Table S5. Case 1. Antibodies used for the immunohistochemical analyses .

Antibody	Clone	Antigen retrieval*	Dilution	Result**	Internal control
CD3	Polyclonal (Dako)	citric acid pH: 6.0	1,000	Negative	Paracortical of lymph node
CD43	DF-T1 (Dako)	citric acid pH: 6.0	250	Partially positive in neoplastic cells	Lymphocytes and macrophages
CD45	PD7/26/16 (Biocare)	citric acid pH: 6.0	4,000	Not reagent	Not reagent
CD57	NK-1 (Novocastra)	citric acid pH: 6.0	100	Negative	Nervous fibers
CD79a	JCB117 (Dako)	citric acid pH: 6.0	50	Not reagent	Not reagent
CD117	YR145 (Cell marque)	citric acid pH: 6.0	400	Not reagent	Not reagent
Iba-1	Polyclonal (Wako)	EDTA pH: 9.0	200	Negative	Macrophages in lymph node
Factor VIII	Polyclonal (Dako)	Not performed	8,000	Partially positive in neoplastic cells	Endothelium of vessels
Ki-67	MIB-1 (Dako)	citric acid pH: 6.0	100	Positive (70%)	Replicative cells of tissues
Lysozyme	Polyclonal (Dako)	citric acid pH: 6.0	1,000	Negative	Macrophages in lymph node
Myeloperoxidase	Polyclonal (Dako)	Not performed	100,000	Negative	Leucocytes
MUM-1	MRQ-8 (cell marque)	EDTA pH: 9.0	50	Not reagent	Not reagent
Pan cytokeratin	AE1+AE3 (Biocare)	citric acid pH: 6.0	1000	Negative	Epithelial cells
PAx-5	BC/24 cm207C (Dako)	citric acid pH: 6.0	200	Negative	Cortical of lymph node

*Heat-induced antigen retrieval was performed at 120 °C (pressure cooker) for 3 min in 10 mmol/L citrate buffer (pH 6) or 1 mmol/L EDTA (pH 9), respectively. **Positive: immunolabeling, characterized by brown precipitate, in neoplastic cells. Negative: absence of immunolabeling in neoplastic cells with positive internal control. Not reagent: absence of immunolabeling in both neoplastic cells and internal control.

Table S6. Case 2. Antibodies used for the immunohistochemical analyses.

Antibody	Clone	Antigen retrieval*	Dilution	Result**	Internal control
pan Cytokeratin	AE1/AE3 (Biocare)	citric acid pH: 6.0	1,000	Negative	Epithelial cells
CD3	Polyclonal (Dako)	citric acid pH: 6.0	1,000	Negative	Paracortical of lymph node
CD4	SP35 (Spring)	citric acid pH: 6.0	50	Not reagent	Not reagent
CD68	KP1 (Dako)	citric acid pH: 6.0	250	Positive	Macrophages in lymph node
CD79a	JCB117 (Dako)	citric acid pH: 6.0	50	Not reagent	Not reagent
Desmin	D33 (Dako)	citric acid pH: 6.0	100	Negative	Muscle
Factor VIII	Polyclonal (Dako)	citric acid pH: 6.0	8,000	Negative	Vessels
PAX-5	BC/24 cm207C (Dako)	citric acid pH: 6.0	200	Negative	Cortical of lymph node
Lysozyme	Polyclonal (Dako)	citric acid pH: 6.0	1,000	Negative	Macrophages in lymph node
Iba-1	Polyclonal (Wako)	EDTA pH: 9.0	200	Positive	Macrophages in lymph node
Ki67	MIB-1 (Dako)	citric acid pH: 6.0	100	Positive 70%	Germinative center
Myeloperoxidase	Polyclonal (Dako)	Not performed	100,000	Negative	Neutrophils
S100	15E2E2 (Biogenex)	citric acid pH: 6.0		Negative	Neural sheets
Smooth muscle actin	1A4 (Life Technologies)	citric acid pH: 6.0	100	Negative	Smooth muscle of vessels
Vimentin	V9 (Invitrogen)	citric acid pH: 6.0	400	Positive	Fibroblasts

*Heat-induced antigen retrieval was performed at 120 °C (pressure cooker) for 3 min in 10 mmol/L citrate buffer (pH 6) or 1 mmol/L EDTA (pH 9), respectively.

**Positive: immunolabeling, characterized by brown precipitate, in neoplastic cells.

Negative: absence of immunolabeling in neoplastic cells with positive internal control.

Not reagent: absence of immunolabeling in both neoplastic cells and internal control.

Detailed information about the antibody suppliers: Novocastra-Leica, Nussloch, Germany; Thermo Scientific Lab Vision, Rockford, Illinois, USA; Biocare Medical, Concord, California, USA; Dako, Carpinteria, California, USA; Wako Pure Chemical, Richmond, VA, USA; Life Technologies- Invitrogen, Carlsbad, California, USA; Sigma, St. Louis, Missouri, USA; Cell Marque, Rocklin, CA, USA; Biogenex, Fremont, CA, USA.

Table S7. Hematological malignancies reported in pinnipeds.

Tumor type	Species	Wild/ Zoo	Country	References
Lymphadenosis and myeloid leukemia	Harbor seal; walrus	Zoo	Denmark	Larsen et al. 1962, seen in Mawdesley-Thomas 1975
Lymphosarcoma	Northern fur seal	Wild	USA	Stedham et al. 1977
Lymphosarcoma	Harbor seal	Wild	USA	Stroud and Stevens, 1980
Primary meningeal T-cell lymphoma	Harbor seal	Zoo	France	Labrut et al. 2007
Multicentric B-cell herpesvirus- associated lymphoblastic lymphoma and T-cell lymphoma	California sea lion	Wild	USA	Venn-Watson et al. 2012
Small B-cell lymphocytic leukemia	California sea lion	Zoo	USA	Doescher et al. 2016
Epitheliotropic T-cell lymphoma	Harbor Seal	Zoo	Germany	Malberg et al. 2017
Lymphosarcoma	California sea lion	Wild	USA	Gerber et al. 1993
Osteosarcoma	Walrus	Wild	USA	Piérard et al. 1977
Giant cell sarcoma	Harbor seal	Zoo	USA	Martoni et al. 2019

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