Hematology and plasma biochemistry in reared beluga (*Delphinapterus leucas*)

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Abstract

Hematology and plasma biochemistry are important references for animal disease diagnosis, health monitoring and disease prognosis. The objective of this study was to establish the baseline profile of hematologic and plasma biochemical characteristics in 4 healthy belugas reared in National Museum of Marine Biology and Aquarium in Taiwan between 2002 and 2011. These 4 belugas, including 3 males and one female, were all around 2-3 years of age when the study started in 2002. Complete blood count (CBC) and plasma biochemical indexes were measured and recorded monthly when routine physical examinations were performed. All values, except notable abnormal ones, were included in the calculation and further analysis. According to the results, the absolute numbers of lymphocytes and eosinophils, and enzyme activities of alanine aminotransferase (ALT), alkaline phosphatase (ALP), gamma-glutamyltransferase (GGT) and lactate dehydrogenase (LDH) decreased with beluga age. On the contrary, the plasma concentration of fibrinogen, inorganic phosphorus, cholesterol, triglycerides, plasma iron and sodium ion increased with beluga age.

Keywords: Hematology, plasma biochemistry, beluga, *Delphinapterus leucas*

Introduction

The beluga, *Delphinapterus leucas*, is an Arctic and sub-Arctic cetacean that has been found along the coasts of Alaska, Canada, Greenland and Russia. A beluga is a small toothed whale and belongs to the family Monodontidae. The baby beluga is born gray and then turns white as it matures. Beluga whales have a life span of 60 years, and their sexual maturity occur around 5 to 10 years of age.

Similar to other animals, hematology and plasma biochemistry are important references for beluga disease diagnosis, health monitoring and disease prognosis. The purpose of this study was to establish the baseline profile of hematologic and plasma biochemical characteristics in four healthy belugas reared in National Museum of Marine Biology and Aquarium in Taiwan between 2002 and 2011.

Materials and Methods

Four belugas were recruited in this study, including three males, Babu, Ginbol and Baby, and one female, Angel. These belugas were acquired at offshore of Russian and then reared in National Museum of Marine Biology and Aquarium. These belugas were around two to three years of age when the study began in 2002 (Table 1).

The belugas were bled from the marvellous vein by using 19G butterfly needles. The samples were collected in the EDTA tubes and heparin tubes, and then sent to the laboratory at 4 ℃. All blood samples were tested within 24 hours after being collected.

Complete blood count (CBC) and plasma biochemical indexes were measured and recorded monthly when routine physical examinations were performed. The characteristics of CBC were examined, including packed cell volume (PCV), hemoglobin (Hb), red blood cells (RBCs), mean cell volume (MCV), mean cell hemoglobin (MCH), mean cell hemoglobin concentration (MCHC), white blood cells (WBCs), blood cell classification, blood platelets (PLT), erythrocyte sedimentation rate (ESR) and plasma fibrinogen (PF). The following plasma biochemical values were also obtained: Total plasma protein (TPP), albumin, globulin, aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), gamma-glutamyltransferase (GGT), creatine kinase (CK), lactate dehydrogenase (LDH), cholesterol, triglyceride, glucose, creatinine, blood urea nitrogen (BUN), inorganic phosphorus (Ip), electrolytes of calcium , sodium, potassium and chlorine, total carbon dioxide (TCO_2), lactate and plasma iron. All values, except notable abnormal ones, were included in the calculation and further analysis. The annual average was computed using the monthly values of the year.

Table 1. Individual information of each beluga.

Name	Gender	Study period	Age (year)
Babu	Male	2002.10 – 2011.12	2 – 11
Ginbol	Male	2002.10 – 2011.12	2 – 11
Baby	Male	2002.08 – 2009.08	3 – 10
Angel	Female	2002.10 – 2011.12	2 – 11

Results

According to the results, the absolute numbers of lymphocytes (Figure 1) and eosinophils (Figure 2), and enzyme activities of ALT (Figure 3), ALP (Figure 4), GGT (Figure 5) and LDH (Figure 6) decreased with beluga age. On the contrary, the plasma concentration of fibrinogen (Figure 7), inorganic phosphorus (Figure 8), cholesterol (Figure 9), triglycerides (Figure 10), plasma iron (Figure 11) and sodium ion (Figure 12) increased with beluga age.

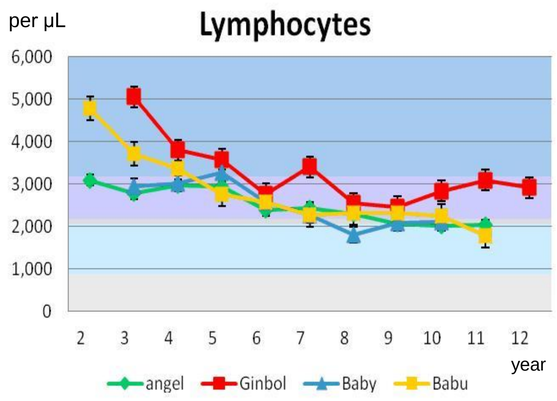

Figure 1. The absolute numbers of lymphocytes decreased by age.

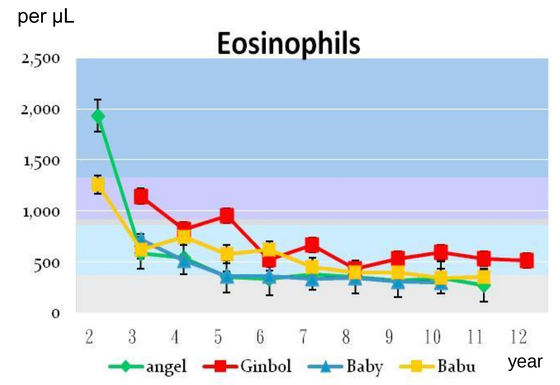

Figure 2. The absolute numbers of eosinophils decreased by age.

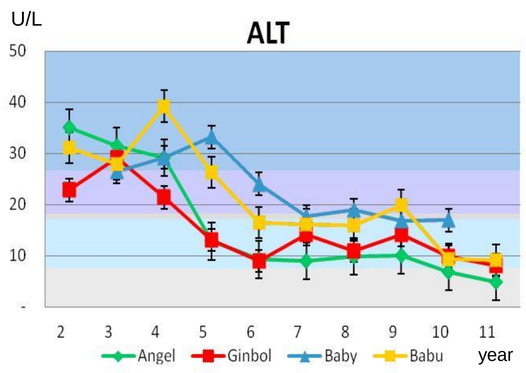

Figure 3. The plasma enzyme activities of ALT decreased by age.

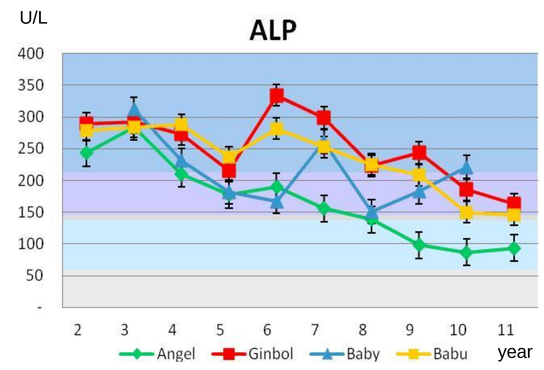

Figure 4. The plasma enzyme activities of ALP decreased by age.

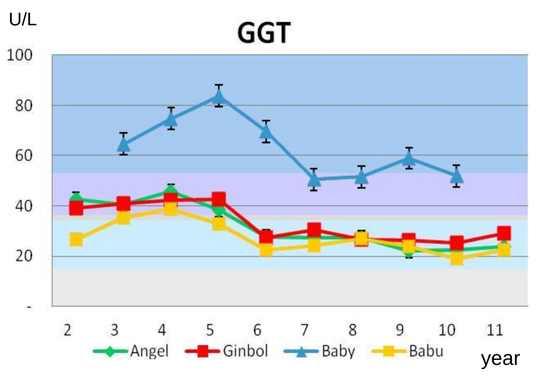

Figure 5. The plasma enzyme activities of GGT decreased by age.

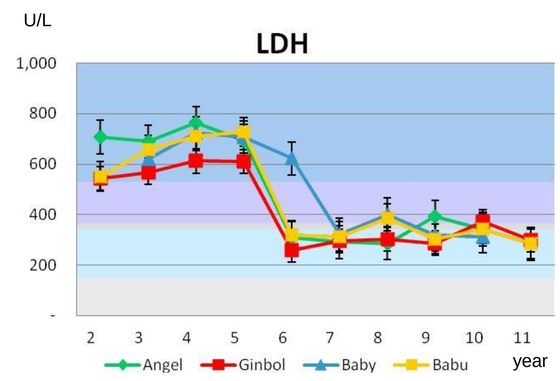

Figure 6. The plasma enzyme activities of LDH decreased by age.

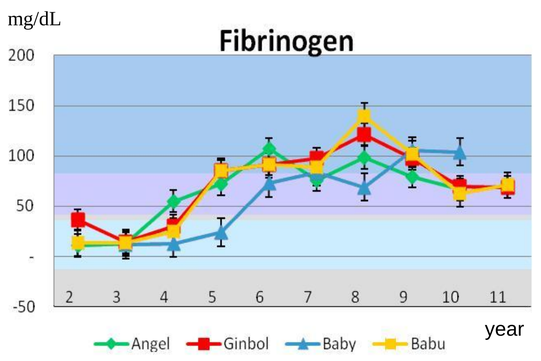

Figure 7. The plasma concentration of fibrinogen increased by age.

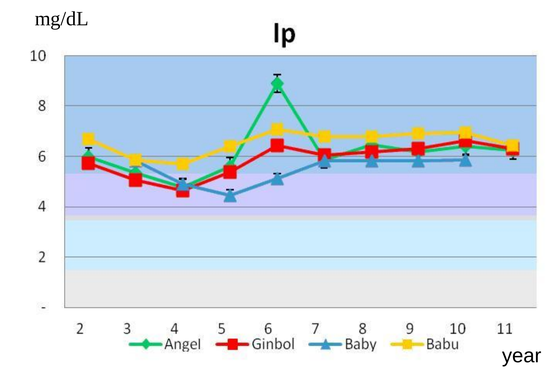

Figure 8. The plasma concentration of inorganic phosphorus increased by age.

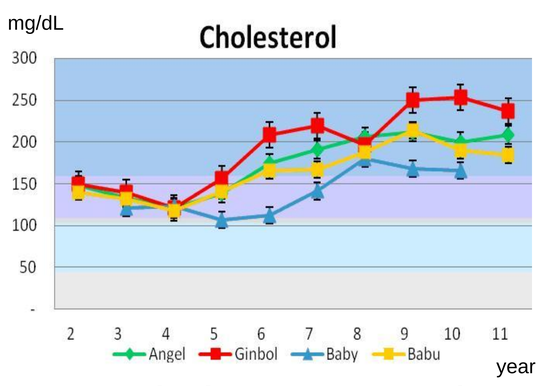

Figure 9. The plasma concentration of cholesterol increased by age.

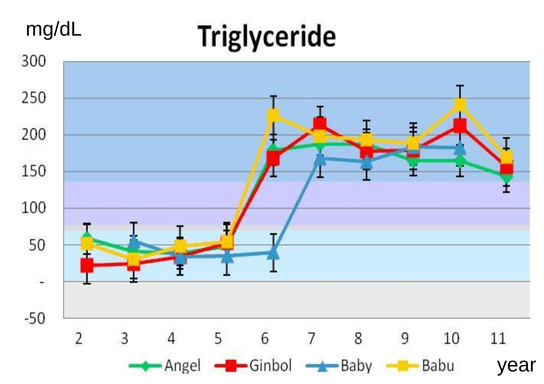

Figure 10. The plasma concentration of triglyceride increased by age.

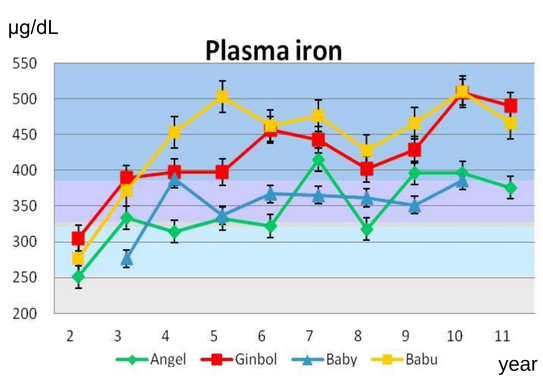

Figure 11. The plasma concentration of plasma iron increased by age.

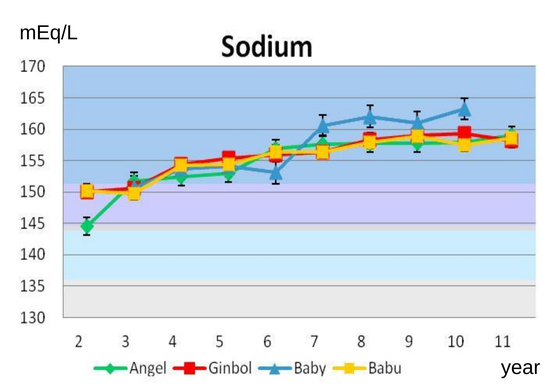

Figure 12. The plasma concentration of sodium ion increased by age.

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