

## A Case Study on an Unusual but Remediable Incident of Hyperlipidemia in a Female Snow Leopard (*Panthera uncia*) Housed at Padmaja Naidu Himalayan Zoological Park, Darjeeling Category: Case Study

Joy Dey<sup>1</sup>, Prishka Pariyar<sup>2\*</sup> and Basavaraj Holeyachi<sup>3</sup>

<sup>1</sup>Assistant Director cum Veterinary Officer, Padmaja Naidu Himalayan Zoological Park, India

<sup>2</sup>Scholar, Padmaja Naidu Himalayan Zoological Park, India

<sup>3</sup>IFS, Director, Padmaja Naidu Himalayan Zoological Park, India

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\*Corresponding Author: Prishka Pariyar, Scholar, Padmaja Naidu Himalayan Zoological Park, India

### Abstract

The present case study reports a secondary case of hyperlipidemia during the routine blood examination in a female snow leopard aged eleven, weighing almost 31 Kgs, housed at the captive breeding center of Padmaja Naidu Himalayan Zoological Park, Darjeeling. The animal showed no visible symptoms and the diagnosis was based on the visual assessments of serum that was observed to be milky-white, followed by laboratory tests that confirmed high triglyceride and cholesterol levels. Further, the absence of a creamy layer on overnight refrigeration of the blood sample suggested that the lipemia and subsequent hyperlipidemia were caused due to elevated levels of either VLDL, LDL, or HDL. Medication with drugs such as Saroglitazar tablets at a dose of 4 mg/day for thirty days was prescribed, apart from reducing the feed quantity. Blood samples were recollected after a month of treatment, and the serum sample was observed to be normal, straw-colored. The serology reports were also found to be within the reference range prescribed by Species 360. Since disease-related threats to snow leopards are crucial yet less known, our study can be useful to the zoo clinicians for future references, while maintaining these vulnerable species under various captive facilities.

**Keywords:** Captive Snow Leopards; Milky White Serum; Cholesterol; Triglycerides

### Introduction

Snow leopards (*Panthera uncia*) are rare and apex predators found in the rugged high mountains of Central and South Asia at an elevation of 3000-5000 meters in the Himalayan and Tibetan plateaus. They are listed as vulnerable in the IUCN Red Data Book of threatened species [1]. Considering their declining population in the wild, Padmaja Naidu Himalayan Zoological Park (PNHZP), a high-altitude zoo situated in the Darjeeling hills has been successfully conducting conservation breeding programs for the species since 1986. Although many studies on their geographic

distribution and behavior have been done in the past, disease-related threats to these vulnerable species tend to be overlooked in the light of more apparent threats such as habitat destruction and poaching [7].

The present study records an incidence of hyperlipidemia in a captive snow leopard with a house name Kim at PNHZP. As far as we inspected, there are no previous reports on hyperlipidemia in snow leopards. Thus, our study might be helpful to the zoo clinicians in understanding the possible diseases and their control, that would aid in successfully managing these exotic species in captive

settings, where similar environmental and husbandry practices prevail.

### Case Report

Blood samples from an eleven-year-old, apparently healthy, female snow leopard, weighing approximately 31 Kgs were collected during the routine blood examination, after the animal was physically restrained in a squeeze cage on July 2021. The venipuncture was done in the lateral coccygeal vein. While centrifuging its venous sample, the serum appeared to be completely opaque, rather milky white (Figure 1). Its serological reports showed a high concentration of glucose (846.6 mg/dl), cholesterol (825 mg/dl), and triglyceride (825.7mg/dl) levels, although no abnormal behavior or history of type 2 diabetes was reported. Further, the lipemic sample was refrigerated and examined the next day. No creamy, jelly-like layer was observed, and since further analysis could not be done as the lipemia inferred with the testing, the samples were discarded.

**Figure 1:** Lepemic serum.

The animal was immediately treated with Saroglitazar tablets which is a dual peroxisome proliferator-activated receptor (PPAR) agonist, having both, lipids and glucose-lowering effects. The drugs (4 mg/day for thirty days) were administered to the animal orally

by mixing it with the meat. The feed quantity was also reduced from 3 kg to 1.5 kg and mutton was excluded from its feeding chart. Beef or chicken was placed at different spots in the feeding chamber to encourage foraging, and the animal was closely monitored by the zookeepers.

Blood samples were recollected after a month of treatment and various serum biochemical parameters were recorded to monitor the course of the disease. The serum was normal, straw-colored in appearance (Figure 2). Besides this, we compared the post-treatment serological reports to a standard report of the animal that was analyzed in February 2021. Both were found to be consistent with the reference intervals (RI) prescribed by Species 360 (Table 1).

**Figure 2:** Normal straw coloured serum obtained after the treatment.

### Discussion

Hyperlipidemia is a clinical condition of an elevated lipid profile such as fats, fatty acids, cholesterol, cholesterol ester, phospholipids, and triglycerides in the peripheral circulation [2], although the term is more frequently used to describe an escalated level of triglycerides (hypertriglyceridemia) or cholesterol (hypercholesterolemia) or both. The affected animals have opaque, milky white-

Biochemical parameters	Standard	Report 1	Report 2	RI (Species 360)
Glucose (mg/dl)	94.4	846.6	92.47	17-227
Cholesterol (mg/dl)	118	825	110.67	102-223
Triglycerides (mg/dl)	76.07	825.7	107.61	20-380

**Table 1:** Comparison in various serum biochemical parameters of the study animal. Standard: control report of the normal serum of the study animal analyzed on February 2021; Report 1: values recorded for milky blood; Report 2: values recorded for the normal serum drawn after a month of treatment; RI: reference intervals prescribed by Species 360.

colored blood called lipemic blood [10] that can be easily detected through visual assessments.

Since published reports on diseases related to abnormal lipid profiles in domesticated and wild felines are almost non-existing in the literature making comparison difficult, we have correlated our case study to those of humans and canines [8,13]. Evans., *et al.* 2003 [1] stated that lipemia was always caused by hypertriglyceridemia, and hypercholesterolemia alone could not cause turbidity. Further, Jonson, 2005 [3] advocated that the turbidity or cloudiness appeared in the serum of dogs when the triglyceride concentrations range from 200-300 mg/dl, and as its concentration increased, the serum became more lactescent (milky). Similarly, slightly turbid serum was observed in one individual snow leopard and common leopard during their routine blood examination in the park. The triglyceride levels recorded for these individuals were 174.745 mg/dl and 179 mg/dl respectively, suggesting that the opinion of Jonson, 2005 [3] might also hold true for felids. Besides this, the cholesterol concentration of 750 mg/dl and above can be considered as severely increased [11] although specific values for assigning lipid-related diseases in snow leopards have not been reported and requires more study. Thus, based on the available literature, and the laboratory reports of our study animal, it was obvious that the present case of hyperlipidemia was caused due to both, hypertriglyceridemia as well as hypercholesterolemia.

Further, there are four types of lipoproteins in nature- chylomicrons, very-low-density lipoprotein (VLDL), low-density lipopro-

tein (LDL), and high-density lipoprotein (HDL). Since chylomicrons are less dense than VLDL, these lipoprotein moves on the top of the sample and form a jelly-like whitish creamy layer on refrigeration [3]. In such cases, the increased magnitude of chylomicrons results in hypertriglyceridemia [9] which is usually short-lived. However, no such observations were reported during the refrigeration test for chylomicrons in our case study, suggesting that the hypertriglyceridemia and subsequent lipemia may be caused due to excess of other lipoproteins, which is concerning.

Many aetiologies have been described in the literature, although those particularly targeting snow leopards are non-existing. Milky blood may be associated with acute pancreatitis, uncontrolled type-2 Diabetes Mellitus, fatty liver, tuberculosis, filariasis, oxidative stress, obesity, inflammation, and nutrition status [3,4,8,12]. In our study animal, the unusually higher values of glucose, cholesterol, and triglycerides were most likely related to high dietary fat intake and lack of exercise. This was confirmed by repeating its laboratory tests after a month of treatment, the results of which showed normal straw-colored serum and hemato- biochemical values well inside the normal range. Presently the animal is doing well in the captive breeding center of the zoo.

## Conclusion

Zoo animals are often prone to obesity, higher values of diet-induced physiological parameters, and stress caused by readily available carbohydrates, lack of exercise, and limited space. Abnormally higher levels of lipid profiles such as triglyceride and cholesterol must be checked as they are risk factors for arteriosclerotic and peripheral vascular diseases. Reduction in body weight, low-fat diet, increase in physical exercise by encouraging foraging through food enrichments, and the use of drugs such as fibrates, nicotinic acids, and insulin [6] is recommended. The present case study also showcases the importance of routine blood examinations to avoid mortality caused due to undiagnosed sickness. Thus, continuous disease surveillance must be prioritized in conservation programs to understand the disease-related threats to these vulnerable species.

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