Comparing hematological and blood biochemistry values in Paso Fino mules, hinnies, donkeys and horses from Colombia

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Introduction

The recreational popularity of mules and hinnies is on the rise, leading to an increased demand for veterinary care for these animals. However, normal reference ranges for physiological, hematological and biochemical parameters for mules and hinnies have not been established; and differences between these hybrid animals and their purebred parents (*Equus asinus* and *Equus caballus*) are likely to exist [1,2.3]. One study [3] reported that most differences were seen in white blood cell lines when comparing healthy mules to horses.

The mule is often perceived to be a strong, sturdy and disease resistant animal yet compared to the horse it has less white blood cells like the donkey which aid in preventing pathogens, diseases and infection [1,2, 3,4]. It has been suggested that the mule and donkey may have fewer white blood cells but the size of the cells have been reported to be larger [3]. The total red blood cell and hematocrit totals (MCV) were reported higher in the mule compared to the horse values thus suggesting the mule may have a greater mechanism to prevent anemia [3].

But what do we know about the hinny compared to the mule, donkey and horse? Previous work from Spain and Portugal indicated differences in white and red cell lines. Furthermore, temperature differences were even found, with the hinnies' temperature being closer to a donkey and a mule's closer to a horse [4]. Ideally, a reference range for mules and hinnies should be established. The current study was designed to establish a reference range for temperature, respiration, heart rate, hematological and biochemical parameters for clinically normal mules and hinnies.

Objective. To measure hematological and biochemical parameters of healthy mules and hinnies and compare those values to horses and donkeys of similar genetics.

Materials & Methods

Animals. A single 10 mL blood sample was collected from venipuncture of the jugular vein with an EDTA tube from 10 donkeys, 12 mules, 9 hinnies and 5 horses of Paso Fino genetics from Antioquia, Colombia.

Hematological and biochemical analysis Samples were analyzed for reticulocyte, leukocyte and biochemical parameters at the Clinical Serology Laboratory, University of Antioquia, School of Veterinary Medicine. Other clinical data included: type of equid, gender, age, body condition score, temperature and heart rates.

Complete blood counts (CBC) were done using the multispecies hematology analyzer (Cromakit's hematological analyzer, Sysmex F-800). The white cell differential was performed with automatic electronic blood cell counter, for in vitro diagnostics. Serum chemistry analysis was done using serum chemistry analysis (Atom's BIOSYSTEMS A15).

This study was approved by North Carolina State University IACUC approval #14-117-O.

Statistical Analysis. Categorical variables from all four equid groups were compared using Pearson's Chi-squared test, while continuous variables were compared using an F-test. Student *t*-test was used for data comparison between two equid groups.

Findings were considered to be significant when P was less than 0.05.

Results

Table I. Comparing significant differences of the hinny, mule, donkey and horse using the Kruskal-Wallis test (P < 0.05)

Parameter	Hinny	Mule	Donkey	Horse	P-value
Temperature °C	37.7	37.7	37.3	37.8	0.03
Hemoglobin	11.7± 1.2	13.3± 1.8	14.1± 2.8	15.1± 1.3	0.024
Hematocrit	31.4± 3.0	34.5 ± 4.6	37.2± 6.9	38.8± 2.5	0.03
Total Bilirubin	0.53± 0.23	0.68± 0.2	0.37± 0.16	0.77± 033	0.004

Table II. Comparing significant differences of the hinny and mule different using the Wilcoxon test (P < 0.05)

Parameter	Hinny	Mule	P-value
Red platelets	169 ± 57	97 ± 57	0.006
Platelets	0.120 ± 0.042	0.073 ± 0.027	0.008

Table III. Comparing significant differences of the horse and mule different using the Wilcoxon test (P < 0.05)

Parameter	Horse	Mule	P-value
Red granulocytes	6.0 ± 1.4	4.1 ± 1.1	0.009
Monocytes	37.8 ± 7.8	57.0 ± 9.6	0.002
Neutrophils	53.2 ± 7.9	37.8 ± 9.1	0.01
Eosinophil	8.02 ± 1.6	4.8 ± 3.0	0.02
Erythrocytes	8.42 ±0 .92	6.74 ± 1.17	0.02
Protein Plasma	7.20 ± 0.16	6.77 ± 0.34	0.02

Table III. Comparing significant differences of the horse and hinny different using the Wilcoxon test (P < 0.05)

Parameter	Horse	Hinny	P-value
Lymphocytes	37.8 ± 7.8	4.1 ± 1.1	0.03
Neutrophils	53.2 ± 7.9	38.1 ± 12.3	0.02
Erythrocytes	8.42 ±0 .92	6.92 ± 1.17	0.03
Hemoglobin	15.1 ± 1.3	11.7 ± 1.2	0.004
Hematocrit	38.38 ± 2.5	31.4 ± 3.0	0.003

Discussion

In this study only a few differences were noted among all four groups but in previous work with Spanish bred mules and hinnies more differences were seen [4].
Baseline values for mules and hinnies are invaluable veterinary science information for those involved in management and disease diagnostics. Differences in previous studies by the research have shown in several studies [3,4] that when comparing mules to horses consistent differences are found in white and red cell lines. Even in basic vital signs such as temperature differences have been found. McLean et al. 2012 showed that the temperature of the mule was closer to the value found in horses and hinnies were closer to that found in donkeys but this study shows the opposite [4]. Continued research is needed in this area.

Conclusion

Conclusion. Established reference values are an essential tool for accurate disease diagnosis in veterinary species. Values vary according to many variables from genetics, environment, level of exercise to management factors (e.g. feeding). Three studies including this one have now identified differences when comparing mules to horses and two have shown differences when comparing all four groups as well as mules to hinnies [3,4].

Considering most lab standards are based on horse values its important to identify the differences. Additional studies of mules and hinnies are needed to establish accepted reference values and to understand parameter differences among equid groups.

References

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