Arabian Horse Foal Information as a Bioassay for Environmental and Husbandry Changes

Irene Ngo, Jaylen Davis, Major(s); Animal Science
Mentor: Dr. Cord Brundage
Kellogg Honors College Capstone Project

Abstract
The Arabian Horse breeding program is institutionally mandated at Cal Poly Pomona and has been since its inception. Environmental factors such as changes in weather and precipitation levels play a major role in foal development, and may be used as a bioassay to evaluate husbandry, care and climate change. Using the Cal Poly Pomona Arabian horses as a sentinel species we evaluated gestation length, animal’s size at birth (height & weight), ability to stand, time until the first nursing, as well as rate of growth within the 1st two months. These were evaluated for all foals born during the 2017 (n=17) and 2018 (n=10) birthing season and this data were compared to data collected in 2012 (n=9). The average gestation length of Arabian foals born in 2018 (33 days +/- 6.46 days) showed lower variation and a greater prediction accuracy rate compared to Arabian foals born in 2017 and 2012 (5.86 days +/- 10.48 days and 5.44 days +/- 12.78 days respectively). There was a significantly higher birth weight in the Arabian foals born in 2018 and 2017 (56.9 kg +/- 22.2 kg and 57.95 kg +/- 16.00 kg) compared to Arabian foals born in 2012 (49.51 kg +/- 16.18 kg). No other parameters evaluated differed significantly between foal cohorts. This data will be compared to archival data to further evaluate changes in foal parameters and evaluate the factors that may be associated with shifts and trend. From the current data set we can conclude that gestation length and birthweight have an increased acuity and may be useful as early indicators of environmental change impact on horse populations.

Results

- **Gestation Length**
  - 2012 (n=9) to 2017 (n=17) and 2018 (n=10)

- **Average Height**
  - Comparison measured at 1 week and at 2 months for foals born in 2012 (n=9) to foals born in 2017 (n=17) and 2018 (n=10)

- **Average Weight**
  - Comparison measured at 1 week and at 2 months for foals born in 2012 (n=9) to foals born in 2017 (n=17) and 2018 (n=10)

- **Foal’s Ambulation Stand**

- **Figure 1:** Compares gestation length of foals born in 2012 (n=9) to 2017 (n=17) and 2018 (n=10)

- **Figure 2:** Average height comparison measured at 1 week and at 2 months for foals born in 2012 (n=9) to foals born in 2017 (n=17) and 2018 (n=10)

- **Figure 3:** Average weight comparison measured at 1 week and at 2 months for foals born in 2012 (n=9) to foals born in 2017 (n=17) and 2018 (n=10)

- **Figure 4:** Graph shows comparison of foal’s time it takes to stand when first born in 2017 (n=17) and 2018 (n=10). No data was taken for 2012 (n=9).

- **Figure 5:** Comparison of annual average temperature in year 2012 vs 2017 and 2018

Conclusion
- This data suggests that temperature and precipitation play a major role in gestation length, height, weight, and the foal’s ability to stand.
- In comparison to 2012, temperature in 2017 and 2018 was relatively cooler, with 2018 being the coolest year.
- Precipitation in 2017 was relatively higher in the earlier months (January-March) than in 2012 and 2018.
- Precipitation in 2012 was higher in the later months (September-December) compared to 2017 and 2018.
- The gestation length showed lower variation in 2018 (n=10) cohort of foals compared to cohort of foals in 2017 (n=17) and 2012 (n=9). There was a significant increase in variation in gestation length for cohort of foals in 2017 (n=17), which may be the result of an increase in precipitation in earlier months of that year as well as cooler temperatures.
- There was a significant increase in height and weight of foals born in 2018 (n=10) in comparison to foals born in 2012 (n=9) and 2017 (n=17).
- The foal’s trend in ambulation time is higher in 2018 (n=10) compared 2017 (n=17).
- There were some limitations to the data such as the fact that the methods used to measure the cohort of foals in 2012 may have differed in the methods used to measure the 2017 and 2018 cohort of foals.
- The 2012 (n=9) foals that were measured did not use all of the same parameters that was used for 2017 (n=17) and 2018 (n=10) cohort of foals. Ex: Ambulation

Future Studies
We will be conducting future research studies using the W.K. Kellogg Arabian Horse Library to determine when the first breeding program started. Furthermore, we will use the same parameters used in this study to compare the impacts that weather and precipitation had on foal development and graph it on a historical timeline. We will continue collecting data on the 2019 foaling cycle and see if environmental factors and changes in weather have improved 2019’s cohort of foals in comparison to 2018 cohort of foals.

Acknowledgements
This project was supported by Dr. Cord Brundage, the Animal & Veterinary Sciences Department of Cal Poly Pomona, W.K. Kellogg Arabian Horse Center, and the Kellogg Honors College Program. Special thank you to all the members of this project and W.K. Kellogg Arabian Horse Center staff for assisting with this project.