Determining the variation in gestation periods and adult weight among twenty different organisms in the phylum Chordata

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Introduction / Background

The time period between conception and birth is known as the gestation period. This period varies significantly between different species of animals and has likely evolved to meet the species individual needs (Reynolds and Miller 1992). Size of the animal plays a significant role but is not the determinant factor. The chinchilla and guinea pig are quite similar in size but have very different gestation periods. The period of the rodent's gestation time also depends on maturity of the young. Typically, organisms that undergo longer pregnancies have offspring that are more mature when born. Another factor that influences the period is food availability, which may differ by season. Food must be available during gestation and following birth, so the mother is able to provide nutrients to her offspring.

Small rodents, particularly mice, are used in experimental procedures for their small generation time. Mice have a gestation period of approximately 20 days (Clancy et al., 2007), and the offspring are born less developed than most other organisms. This allows for researchers to modify the fetus and observe the effects both during and after pregnancy. Organisms with longer gestation periods and more developed offspring have also been used in studies to determine how environmental factors influence the survival of the offspring upon birth (Bonney 2013). A lot of research can be gained from looking at the gestation periods of organisms. Different organisms are used for experimental procedures, such as mice for genetic studies and rats for neurological modification. Researchers are able to gather a wide array of data using each different species, in order to form better suited conclusions in relations to humans (Clancy et al., 2007).

In this descriptive study on the phylum Chordata, twenty organisms will be analyzed to determine how each of their gestation periods relates to their adult body size.

Research Question/Hypothesis

The study at hand was done to determine if there were significant differences in the gestation periods of rodents in the relation to their body weight. It was hypothesized that the gestation period is proportional to the weight of the animal. If the weight of the animal is larger, they are more likely to endure a longer gestation period. The null hypothesis states: there is no difference in the gestation period in relation to a rodent's body weight.

Methods or Activities

The gestation periods and weights of twenty different adult rodents (phylum Chordata) were analyzed in order to determine differences among them. The data was obtained from peer-reviewed journal articles and zoological databases. Following the data collection, a t-test was performed in order to test the statistical significance of the hypothesis.

Figure 1: Examples of organisms from the researched phylum.

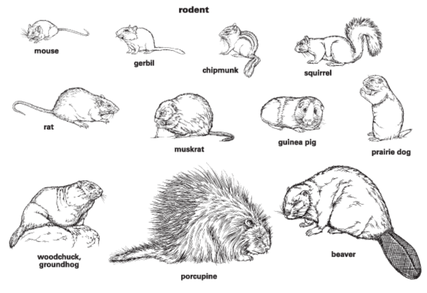
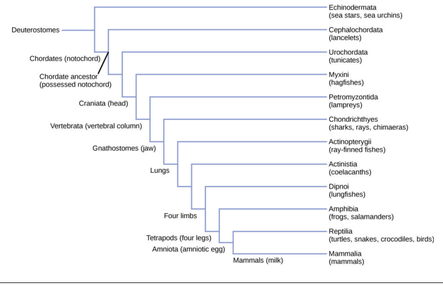


Figure 2: Phylogenetic analysis and characteristics of the Chordata phylum.



Results / Discussion

Graph 1: Displays the variation in species gestation times.

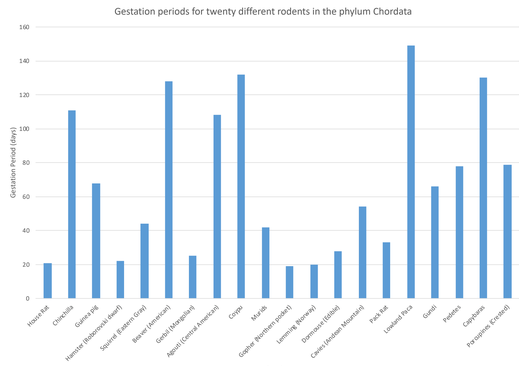
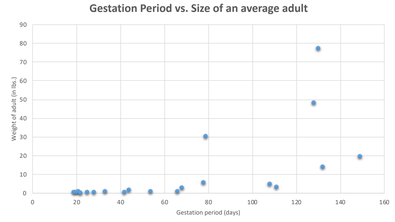


Table 1: Displays the common name for each rodent species with their respective gestation time.

Species	Gestation period (days)	Adult weight (lbs.)
House Rat	21	0.50
Chinchilla	111	3
Guinea pig	68	2.6
Hamster (Roborovski dwarf)	22	0.055
Squirrel (Eastern Gray)	44	1.3
Beaver (American)	128	48
Gerbil (Mongolian)	25	0.125
Agouti (Central American)	108	4.7
Coypu	132	14
Ricefield rat	42	0.375
Gopher (Northern pocket)	19	0.23
Lemming (Norway)	20	0.16
Dormouse (Edible)	28	0.28
Cavies (Andean Mountain)	54	0.56
Pack Rat	33	0.625
Lowland Paca	149	19.5
Gundi	66	0.625
Pedetes	78	5.6
Capybaras	130	77
Porcupines (Crested)	79	30

Graph 2: Depicts the variation in gestation periods in correlation to adult body weight.



P-value for 95% confidence interval: 0.002331

The p-value is significant, for it is under the standard 0.05 which provides support to reject the null hypothesis.

Conclusions

In this study, the gestation periods and body weights of twenty organisms in the phylum Chordata were analyzed to determine if body weight was the primary factor in gestation time. The p-value was calculated to be 0.002331, which concludes to rejecting the null hypothesis. There is a significant difference between gestation period and body weight, for they are likely proportional to each other. Many organisms in the phylum Chordata have shorter gestation times, for they are small and are altricial upon birth. The offspring can attach to their mother's nipple and receive nutrients until they are mature enough to forage on their own. Some organisms with longer gestation periods are born precocial, in which they are developed from birth to survive without their mother's direct influence (Brown 1936). Nutritional requirements may be a larger factor to gestation period than initially believed. In a study done by the Alcohol Research Center in California, pregnant rats were subjected to ethanol, which changed many factors. The rat pups were malnourished (due to ethanol changing the nutrient sufficiency), the gestation periods were prolonged, and the offspring had a less chance for survival. Although this was under the presence of alcohol, this provides valuable information how mal nourishment in the wild can influence gestation and the health of the offspring (Wiener et al., 1981).

Bibliography

Bonney E. A. (2013). Demystifying animal models of adverse pregnancy outcomes: touching bench and bedside. *American journal of reproductive immunology (New York, N.Y. : 1989)*, *69*(6), 567–584. https://doi.org/10.1111/aji.12102

Brown, C. (1936). Rearing Wild Animals in Captivity, and Gestation Periods. *Journal of Mammalogy, 17*(1), 10-13. doi:10.2307/1374541

Clancy, B., Finlay, B. L., Darlington, R. B., & Anand, K. J. (2007). Extrapolating brain development from experimental species to humans. *NEUROTOXICOLOGY - ILLINOIS THEN ARKANSAS*, *5*, 931.

Reynolds, P., & Miller, B. (1992). New firm gestation: Conception, birth, and implications for research. *Journal of business venturing*, *7*(5), 405-417.

Wiener, S. G., Shoemaker, W. J., Koda, L. Y., & Bloom, F. E. (1981). Interaction of ethanol and nutrition during gestation: influence on maternal and offspring development in the rat. *J Pharmacol Exp Ther*, *216*(3), 572-579.