

Exploring the Relationship Between Body Size and Life Expectancy in

Dogs: Why Small Breeds Live Longer

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Introduction

- This research endeavor seeks to explore the multitude of reasons why the relationship between body size and life expectancy in domestic dogs is abnormal when compared to wild animals.
- This discrepancy within the animal kingdom will be examined by first establishing the scientifically understood and accepted relationship between body size and life expectancy in animals, and then furthermore into mammals.
- It is then imperative to discuss the inverse relationship that domestic dogs possess when compared to most other animals. Once this groundwork has been laid, there is much to be learned as to why this phenomenon occurs.
- From genetics to evolution to artificial selection, there seems to be much that is already understood, but there seems to be no one concrete explanation, which has left the door open for more research into this topic.

Research Question

- What explains the inverse relationship that domestic dogs have between lifespan and body size when compared to other animals?
- Is this trend seen in other domesticated animals?

- Have humans had a profound impact on the genome of domestic dogs as well as genomes of other animals?

Background and Literature Review

- There is a stark contrast between the relationship involving body size and life expectancy when comparing the trend in domestic dogs to most other animals. This research endeavor seeks to explore the multitude of reasons why this is the case.
- “Bigger animals live longer” (Speakman, 2005, p. 1717). This is trend that is observed within the animal kingdom. This is explained by energy expenditure and metabolic rate.
- Larger mammals and birds have more physiological and morphological advantages due to their body size over smaller ones that has made them more adept at surviving long enough to reproduce, which is one of the most important factors in natural selection.
- Inbreeding of dogs since then have had profound effects on the entire dog genome.
- While expression level of the IGF-1 gene, which exists not just in dogs, is a huge predictor of dog size and therefore, life span, there seems to be much more

conjecture as to what else could be contributing to this unusual trend. Speculation into more than individual genetics such as evolutionary patterns, artificial selection effects, environmental and biochemical factors, etc. should be expanded upon to attempt to get a much clearer understanding of the strange phenomenon where smaller breeds of domestic dogs live longer than larger breeds.

Methods

- The scientific research design will involve peer-reviewed articles and other sources from archives. Primary sources that have been scholarly reviewed by experts in the field will be used most the begin to answer the research question.
- These sources establish that the general trend between lifespan and body size within the animal kingdom is that larger animals tend to live longer. Other primary sources will then be used to establish similar trends in mammals, and canines.
- The evolutionary history, specific phenology, artificial selection of dogs, and the genetic outcomes of inbreeding will begin to help answer the research question while also leaving room for more investigation into the topic due to its ambiguity.

Expected Results

- It is expected that more than individual genetics and effects, such as mutations, of the IGF-1 gene have had a profound impact on dog genomes, which could explain the

opposite trend that domestic dogs have between lifespan and body size when compared to wild animals.

- The impacts of humans on dog genomes are expected to shed light on this odd phenomenon.
- It could be found that humans have not had a profound impact on the dog genome to cause this but is unlikely due to the long history and relationship that humans have with canines.
- In domesticating wolves into companions, humans artificially selected for more “dog-like” features until modern breeds began to erupt at high rates of inbreeding, so it is very likely that centuries of this has affected the dog genome enough to produce the inverse relationship that they possess between body size and life expectancy.

Significance

- It is worthwhile to investigate this topic to gain a better understanding of why this trend occurs in domestic dogs, and possibly other domesticated animals. This could be viable information for those going into the field of veterinary medicine, animal genetics, etc.
- In attaining a better understanding of why this odd trend of the animal kingdom could implore more research into the effects that artificial selection, inbreeding, and therefore domestication of animals performed by humans have had on animal genomes.

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