

Effects of Inbreeding on Canine Health

Author: Abbie Wong
Theme: Exchange
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INTRODUCTION

Inbred dogs are more susceptible to genetic disorders and inheritable diseases due to the limited genetic diversity within their gene pool. The exchange between paternal and maternal genetic material results in homozygosity, which can increase the chances of offspring being affected by recessive traits.

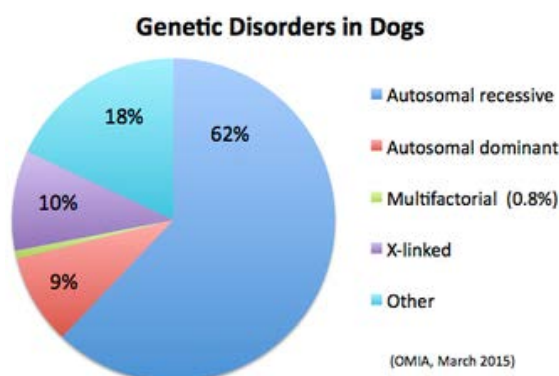


Figure. 2 Pie-chart of the prevalence of canine genetic disorders

AIMS

- Demonstrating that inbred dogs tend to have shorter lifespans compared to non-inbred dogs.
- Demonstrating that inbred dogs tend to have a poorer health condition compared to non-inbred dogs.

METHODOLOGY

To find out the relationship between lifespan and inbreeding among dogs, inbreeding and longevity in Bernese mountain dogs are being investigated. The Tabular method is used to calculate the coefficient of inbreeding (COI) of all the 60000 individuals. And there are 789 individuals with at least 8 generations of complete ancestor information for determining the relationship between inbreeding and longevity.

Linear models are used to determine the effect of inbreeding on longevity taking into account the effect of birth year, sex, pet vs breeding dog status.

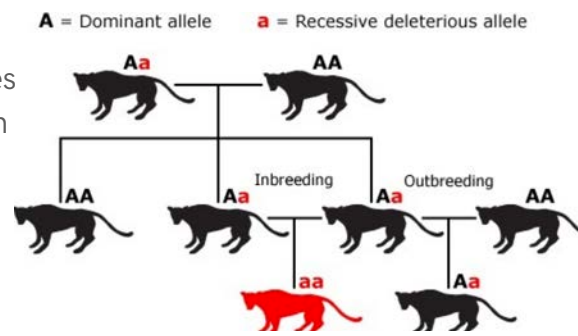


Figure. 1 diagram on animal inbreeding

As crossing two carriers runs a risk of approximately 25% of offspring inheriting two copies of the mutation, resulting in expression of the disorder. Inbreeding dogs usually increases the risk of inheriting genetic disorders and health issues as it increases the chances of passing on deleterious recessive genes for disease. While recessive genetic disorders represent the most prevalent type of inherited conditions in canines.

RESULTS

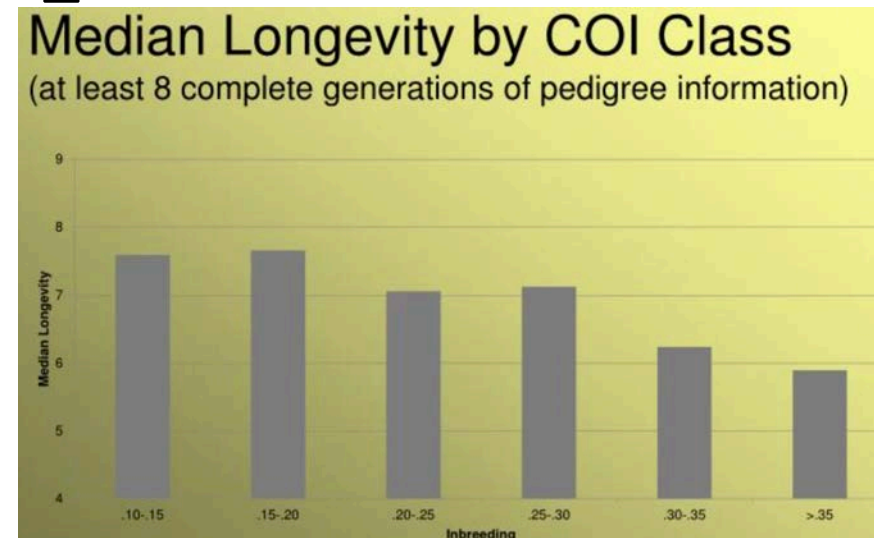


Figure. 3 Bar chart of the median longevity by COI class

This result suggests a negative correlation between inbreeding and lifespan as a higher coefficient of inbreeding (COI) is associated with a shorter median lifespan in dogs. In other words, the overall longevity of the dogs tends to decrease when the inbreeding level increases. The decrease of longevity indicates that there is a worse health condition among inbred dogs (e.g. genetic disorder)

Split the data (total 789 dogs are investigated)

- 79 dogs died before 2 years of age while 710 dogs died after 2 years of age
- For before 2 years of age: for every 1% increase in inbreeding a dog lives on average 20.6days shorter.
- For after 2 years of age: for every 1% increase in inbreeding a dog lives on average 9.2days shorter.

REFERENCE

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RESEARCH

Progressive retinal atrophy (PRA) is an inherited eye disease that causes blindness in dogs[1]. Inbreeding can significantly increase the risk of developing this disorder because it raises the likelihood of both parents sharing the same genotype and carrying the deleterious recessive gene. This increases the probability of producing offspring with the homozygous recessive genotype responsible for the disease and heightens the risk of PRA in the offspring.

CONCLUSION

- Inbreeding in dogs will shorten their lifespan and increase the chance of getting recessive genetic diseases such as PRA.
- By reducing genetic diversity and increasing homozygosity, inbreeding enhances the probability of harmful genetic conditions being expressed, causing more sufferers of genetic diseases.

DISCUSSION

Inbreeding can result in more predictable characteristics and is often used to preserve breed purity, which makes it easier to produce dogs with a uniform appearance for commercial purposes. However, inbreeding increases the risk of harmful traits and the loss of genetic diversity. These make the dogs more susceptible to genetic disorders and vulnerable to diseases. This leads us to question ourselves — **Are the benefits of inbreeding worth the risk to our canine's health?**