Abstract

The purpose of this lab was to examine inheritance patters in cats through a computer program called Catlab. Two specific questions were asked. What is the inheritance mechanism for a black verses gray coat color? Also what is the inheritance mechanism for an all white coat verses a non-white coat? Through Catlab cats were bought and bred in order to see which of the two traits in our question was dominant and which was recessive. Through the experiment it was determined that the black and white coats were the dominant traits. These results were verified through different crosses between the parents and children. So it can be said that in other crosses the black and white traits will be dominant.

Introduction

Genetics is a very important part of biology. It explains how we inherit our traits by passing on dominant and recessive characteristics from one generation to the next. With the discovery of DNA as the biological roadmap to the human body, scientists can recognize certain patters in inheritance and now can even trace certain traits to specific genes. Genetics also is evidence for the theory of evolution. Genetics helps explain Darwin's theory because like evolution, genetics is a change in population over time which involves dominant traits prevailing over weaker ones in order for survival. It is important to understand how traits are acquired so we know what causes certain defects or abnormalities and maybe pinpoint the cause before birth just by looking at the genes. The purpose of this lab is to examine inheritance mechanisms for certain traits (color and coat pattern) of cats. In a more general way, we are examining the methods by which inheritance occurs. For this experiment a computer program called Catlab was used in

order to determine inheritance mechanisms for cats. In this program, cats were bought and bred to produce different generations. These generations could be bred with each other or with the original parents. Through a series of crosses and back crosses with different parents the determination of the dominant trait came out.

Question 1: What is the inheritance mechanism for black verses gray coat color

H_a: Black is the dominant trait

H_o: Black is not the dominant trait

Question 2: What is the inheritance mechanism for all white verses not all white color.

H_a: White is the recessive trait

H_o: White is not the recessive trait.

Materials and Methods

This lab was conducted on February 28th in the Garver Computer lab at 6 p.m. The equipment used was a computer and the program Catlab. This lab studied the inheritance mechanisms in cats. Using cats acquired in the program, they were bred and the phenotype was examined. Based on the phenotype assumptions were tested in order to determine the genotype of the cats. Other crosses were done between the children and parents to get reliable data as to the genotype.

Results

Question 1 What is the inheritance mechanism for black verses gray coat color?

For this part two parents, 1 all gray male (2) and 1 all black female (1) were acquired. These cats were bred to produce an F1 generation. The F1 generation had 3 females and 5 males all of which were black.

F1 Generation of original parents (1) and (2)

Sex	Phenotype
(3) Male	Black
(4)Female	Black
(5) Female	Black
(6) Male	Black
(7) Male	Black
(8) Male	Black
(9) Male	Black
(10) Female	Black

A second generation was produced from the same parents. This F2 generation had 6 females and 2 males which again were black

F2 Generation of original parents (1) and (2)

Sex	Phenotype
(11) Female	Black
(12) Female	Black
(13) Male	Black
(14) Female	Black
(15) Male	Black
(16) Female	Black
(17) Female	Black
(18) Female	Black

Next, the same Gray male father was bred with one of his black daughters in the F1 generation. This produced 4 males and 4 females. 3 of the males were gray 1 was black. 3 females were black one was gray.

F1 Generation of original father (2) and *first daughter (4)* of original F1 generation

Sex	Phenotype
(19) Male	Black
(20) Female	Black
(21) Female	Gray
(22) Male	Gray
(23) Male	Gray
(24) Male	Gray

(25) Female	Black
(26) Female	Black

These parents were bred again to produce a F2 generation. In this generation 5 females and 3 males were produced. 2 males were black while one was gray. At the same time 2 females were black while 3 were gray.

F2 Generation of original father (2) and *first daughter* (4) of original F1 generation

Sex	Phenotype
(27) Male	Black
(28) Female	Black
(29) Male	Gray
(30) Female	Gray
(31) Female	Gray
(32) Female	Gray
(33) Male	Black
(34) Female	Black

Next one gray male (24) and one gray female (21) of the original father (2) and his first daughter (4) were bred. This produced 4 male and 4 females all of which were gray.

F1 Generation of gray male (24) and gray female (21)

Sex	Phenotype
(35) Male	Gray
(36) Female	Gray
(37) Female	Gray
(38) Male	Gray
(39) Male	Gray
(40) Female	Gray
(41) Male	Gray
(42) Female	Gray

Question 2: What is the inheritance mechanism for all white vs. not all white

2 parents were obtained 1 female Black (1) and one White male (2). They were bred and produced 4 males and four females. 3 males were white while 1 was black with some white. 3 females were white while one was all black

F1 Generation of Female black (1) and Male White (2)

Sex	Phenotype
(3) Male	White
(4) Female	White
(5) Male	White
(6) Female	White
(7) Female	White
(8) Male	White
(9) Male	Black with some white
(10) Female	Black

These 2 were again bred and 4 males and 4 females resulted. 3 males were white while one was black blotched with some white. 3 females were white while 1 was black with some white.

F2 generation of same parents (1) and (2)

Sex	Phenotype
(11)Female	White
(12)Male	White
(13)Male	White
(14)Female	White
(15)Male	White
(16)Male	Black Blotched with some white
(17)Female	White
(18)Female	Black with some white

Next the mother (1) was bred with her son from the F1 generation and 6 males and 2 females were produced. 2 males were all black and the rest were black with some white. 1 female was all black and 1 was black with some white.

F1 generation of mother (1) and son (9)

Sex	Phenotype
(19) Male	Black with some white
(20) Male	Black
(21) Male	Black
(22) Female	Black
(23) Male	Black with some white
(24) Female	Black with some white
(25) Male	Black with some white
(26) Male	Black with some white

Next the father (2) and one of his first generation daughters (4) were bred. 2 were male and 6 were female. One male was black and one was white. 5 females were white while one was black with some white.

F1 From father (2) and daughter (4)

Sex	Phenotype
(27) Female	Black with some white
(28) Female	White
(29) Female	White
(30) Female	White
(31) Male	Black
(32) Female	White
(33) Female	White
(34) Male	White

Discussion

What is the inheritance mechanism for black vs. Gray

In mating the black female with the gray male the first generation was all black. This leads to the conclusion that black is Homozygous dominant, but just to make sure an F2 generation was bred, and just like the first one all were black. So black seems to be homozygous dominant. To make sure black was dominant and gray recessive I bred the gray male father with one of his first generation black daughters. This would make their

offspring 50% black and 50% gray because the black daughter got a recessive trait from her male gray father. I again bred them to determine if the results were accurate and they were 50% black and 50% gray. To get the recessive trait out, I one gray male and one gray female from the father daughter offspring was bred. Gray was the only color produced, so gray must be the recessive trait. So the hypothesis was correct: black is the dominant trait.

What is the inheritance mechanism for all white vs. not all white

In mating the black female and the white male the majority were white leading to believe that white was the dominant trait. So another mating took place. Just like before 6 were white and 2 had black in them. This led to the conclusion that white was the dominant trait but it must be heterozygous because the recessive phenotype showed up 1 in 4 times or 2 in 8. To make sure this was the case the black mother mated with her first generation black with some white son and produced a litter with no white at all. This proves that black is the recessive trait. To make sure white is the dominant trait, the white father bred with his first generation white daughter and got the same ratio as before: 2 out of 8 had some black in them. In this case the null hypothesis was correct.

Observing Dominant and Recessive Traits in Cats

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Tuesday 11:00 – 12:50

Principles of Biology 2 Lab

3/1/2004