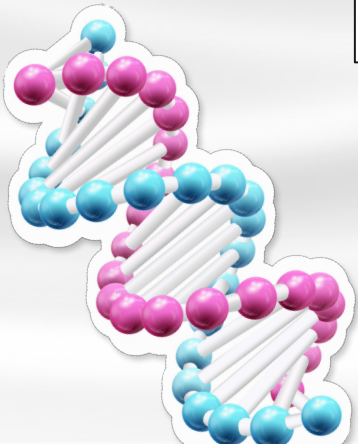
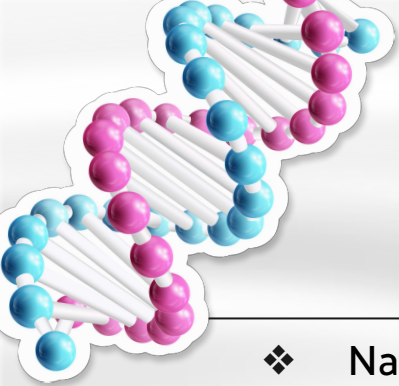


Natural Selection Lab Simulation

Group 3

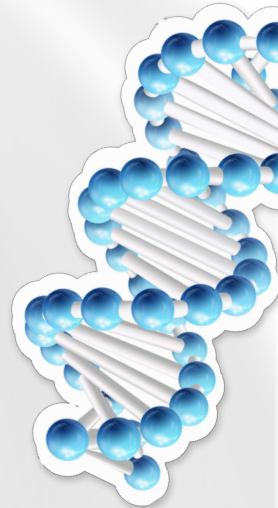
*Christian Xu, Jeremiah Carrasco, Cemile Koseoglu,
Denise Soledad Cano*

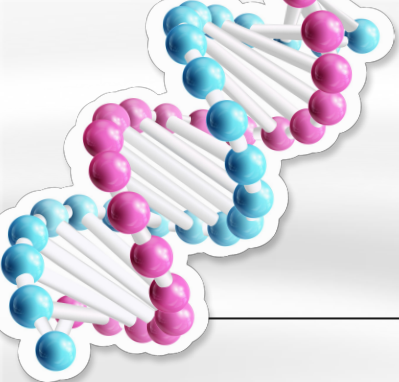




INTRODUCTION

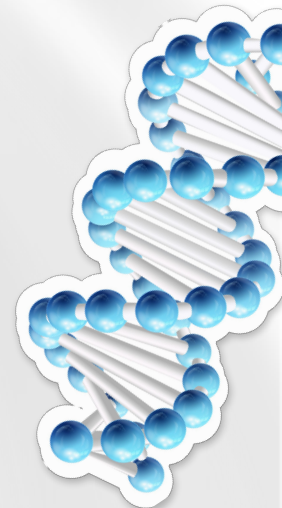
- ❖ Natural Selection: adaptation to one's environment allowing survival and reproduction.
- ❖ Variation is a critical factor in Natural Selection and Evolution.
- ❖ Traits have a direct correlation with the survival of a species based on their environment.





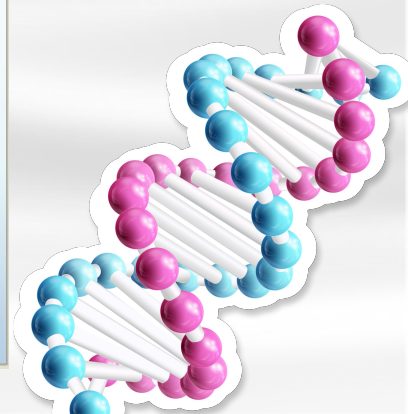
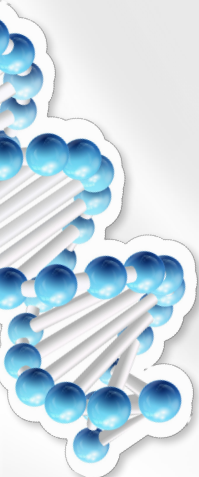
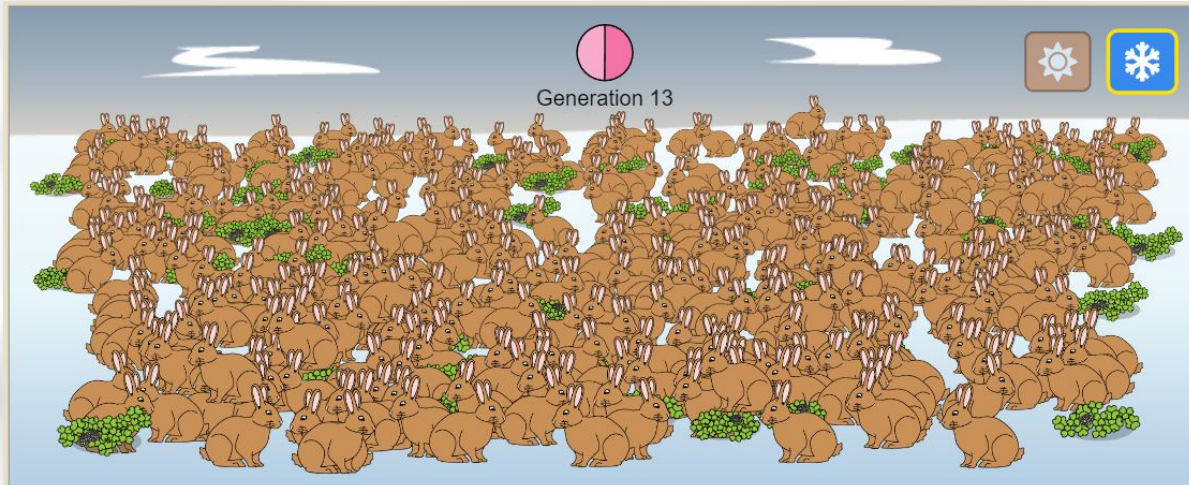
INTRODUCTION cont.

- ❖ In this experiment, we determine which traits and genetic mutations allow higher rates of survival and reproduction, and which are neutral.
- ❖ The different traits: Fur Color (White or Brown), Teeth Size (Short or Long), Ear Orientation (Floppy or Upright)
- ❖ Environmental Factors: Wolves, Weather, Lack of food and Food Type (Hard or Easy to consume)



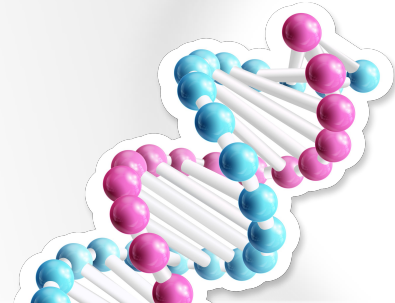
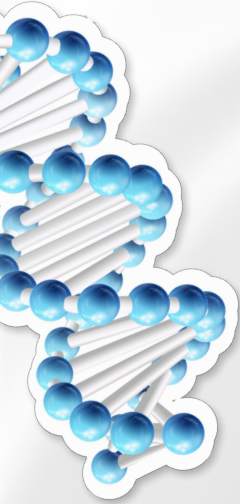
Hypothesis

If the bunny population was subjected to a sudden change in climate, then the population would not die out if there were still varying mutations present within the populace.

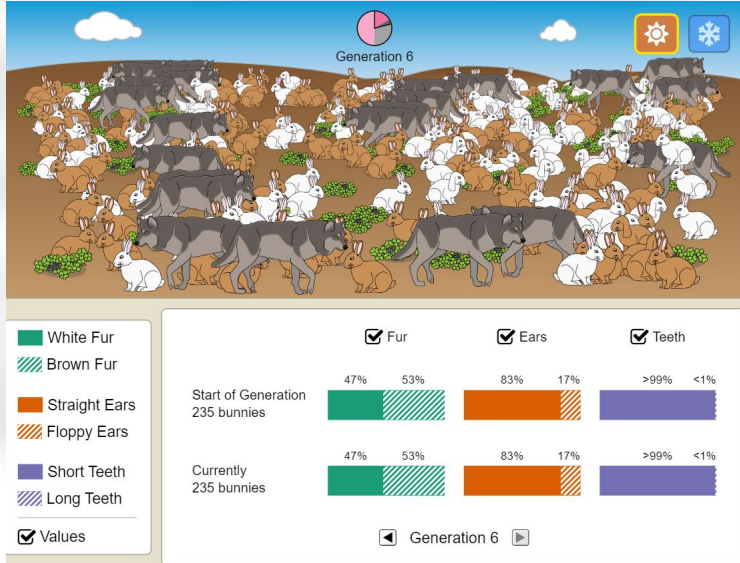


Methods/Procedure

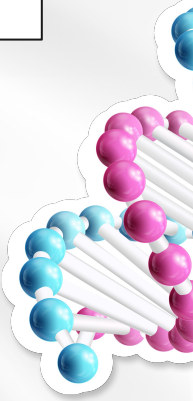
- ❖ 2 Scenarios:
 - ❖ Desert → Tundra Experiment
 - ❖ Tundra → Desert Experiment
- Switches in climate throughout generations
 - Species reaction to wolf predation and tough food



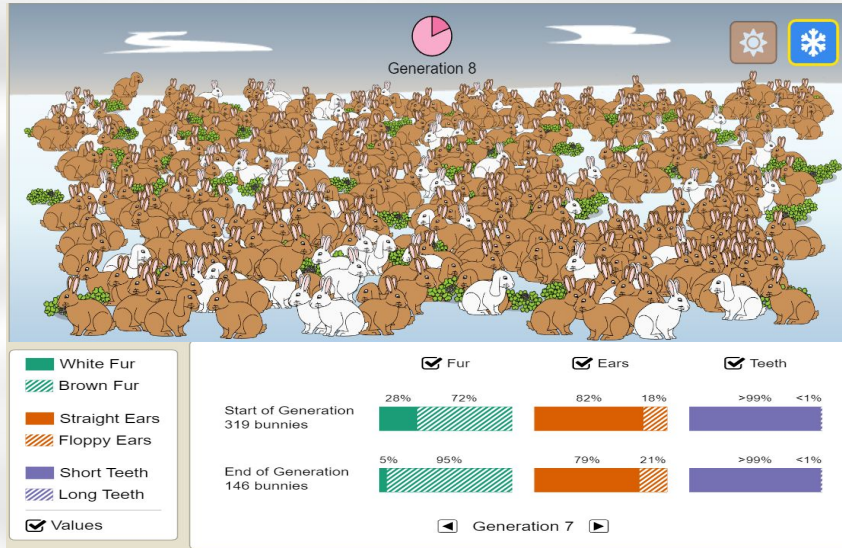
Desert-Tundra Results



- ❖ Generation 1-5: Population Growth
- ❖ Start of Generation 5: Wolves added
- ❖ - White Fur Population Decreases;
Brown Fur Increases

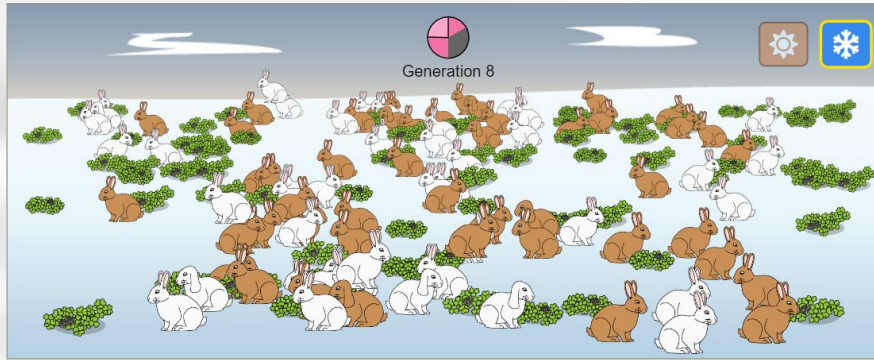


Results cont.

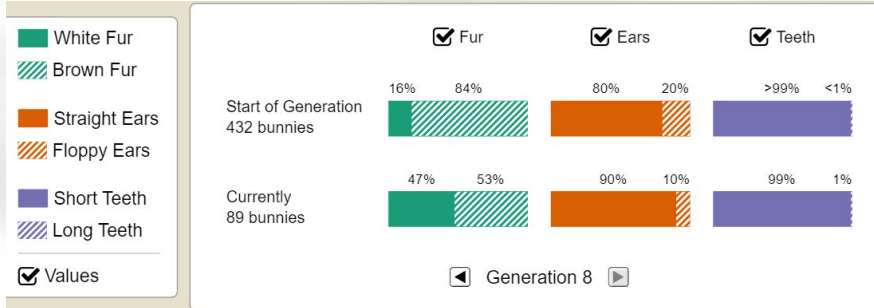


- ❖ Start of the 8th generation
 - Switch from desert to tundra biome
 - Majority Population: Brown Furred

Results cont.



- ❖ End of the 8th generation
- Split population



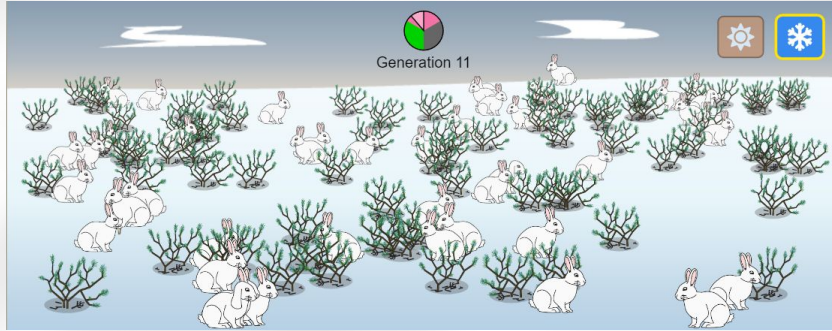
- ❖ Wolves consumed 31% of brown furred population

Results cont.



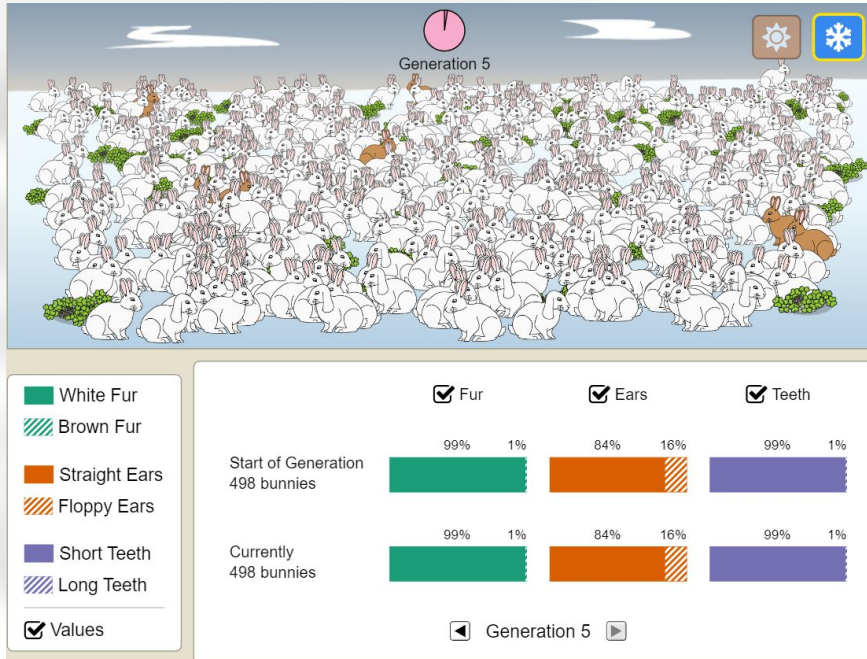
- ❖ At the start of Generation 11 - White Fur Population peaks

Results cont.



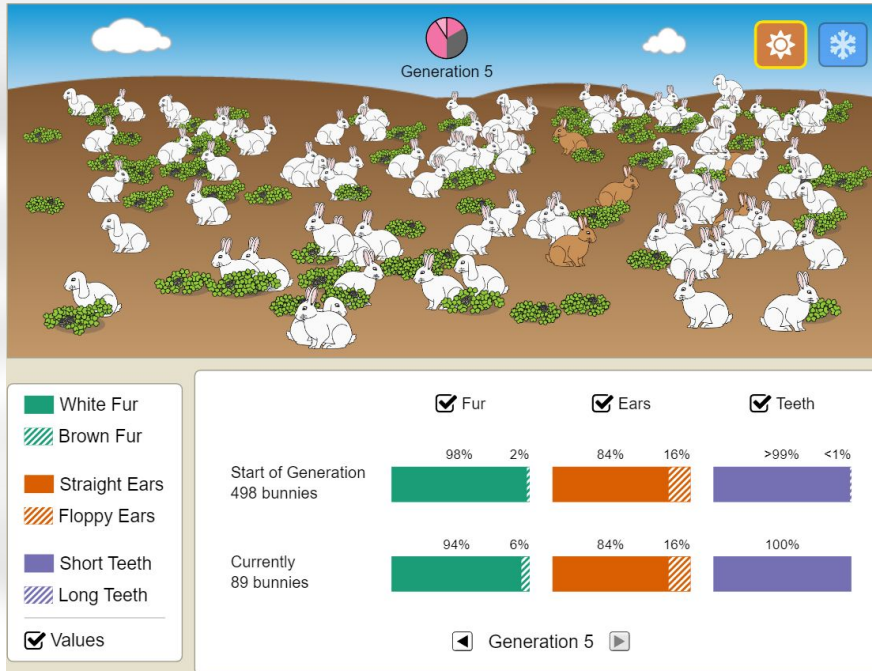
- ❖ Add Environmental Factor: Tough Food
- ❖ End of Generation 11: Major Decline in Bunny Population
 - Bunny Population eventually dies out

Tundra-Desert Results



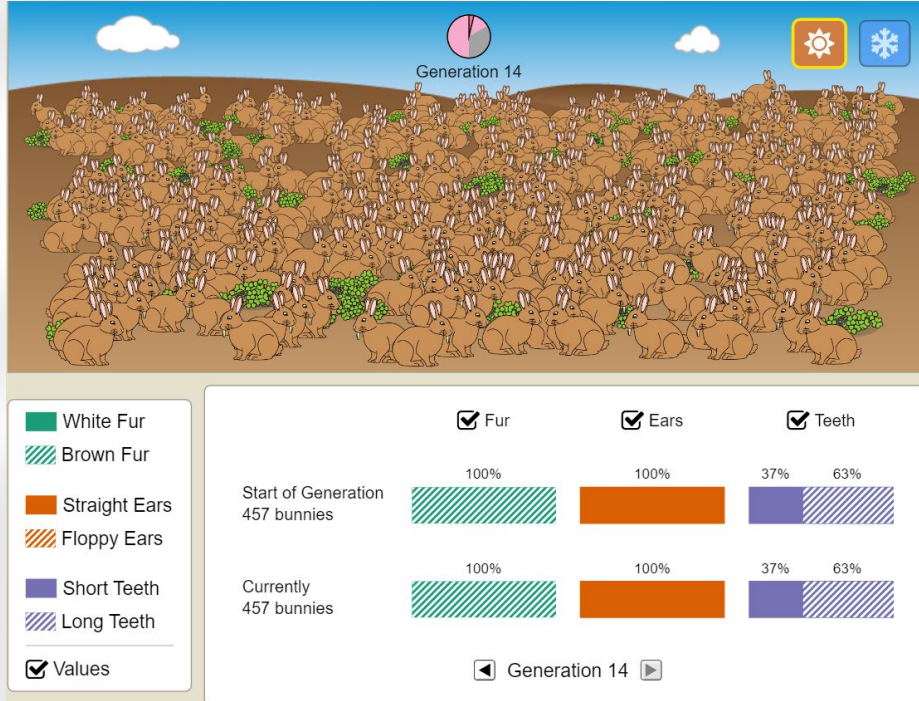
- ❖ Start of the Generation 1-5
 - Majority Population: White Furred

Results cont.



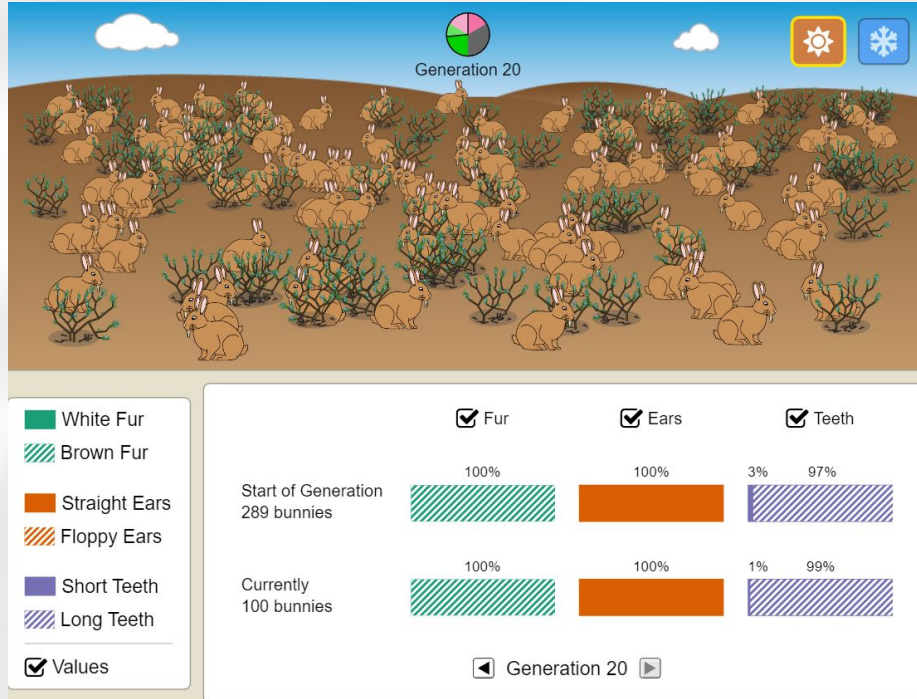
- ❖ End of the 5th generation
 - Switch from tundra to desert
 - Environmental Factors: Wolves
 - Majority Population: Still white furred, brown furred population remains intact

Results cont.



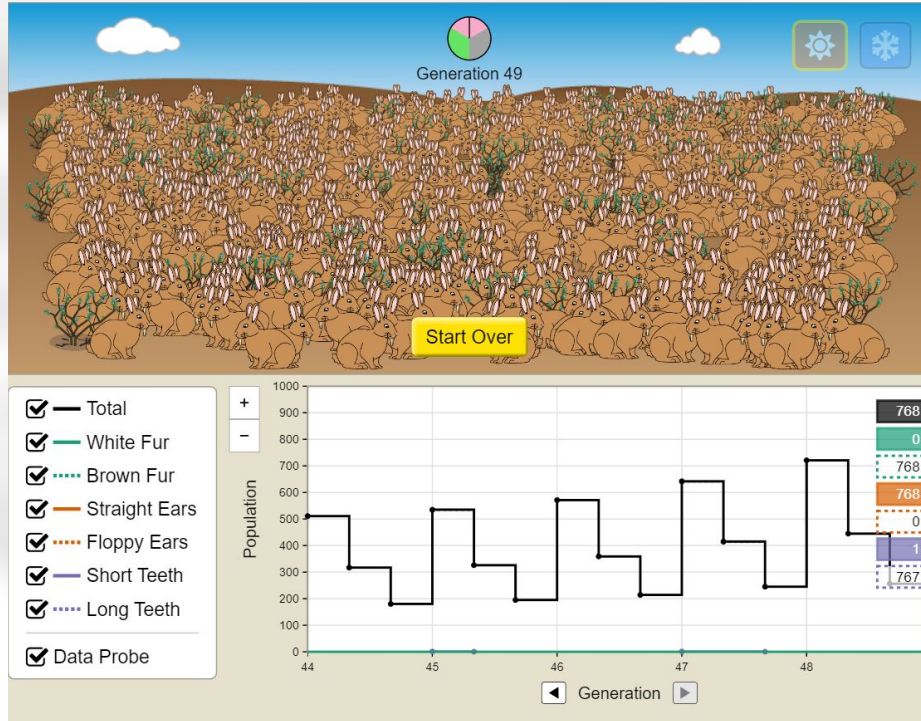
- ❖ Start of Generation 14
- Entirely Brown Furred Population
- ❖ Introduce 'Tough Food'

Results cont.



- ❖ Brown Furred Population w/Long Teeth Trait dips and rises until their rate of growth exceeds their rate of death (via wolves).

Results cont.



- ❖ Unbounded Population Growth
- ❖ 49th Generation: Bunnies have taken over the world!

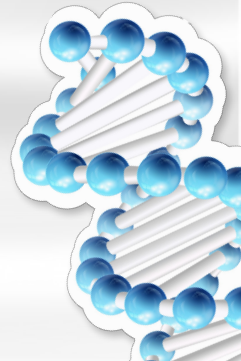
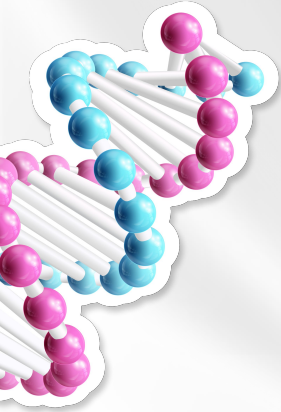
Limiting the Population



- ❖ In order to limit the population and prevent unbounded population growth
 - Limit the food

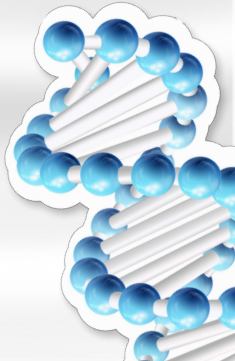
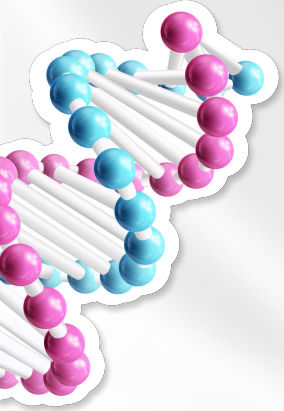
Discussion

- ❖ Our experiments supported our hypothesis
 - Desert-Tundra Experiment proved:
 - Lack of necessary gene trait (long teeth) leads to species extinction
 - Tundra-Desert Experiment proved:
 - Even a population with a small group of varied traits can lead to species survival when environmental factors change



Discussion cont.

- ❖ Our simulation subjects a species to a rapidly changing environment where they can't escape.
- ❖ Populations with specific alleles seek an environment where their traits will best suit their survival (Lenormand, 2002)



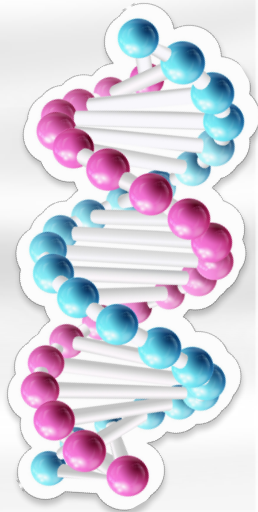
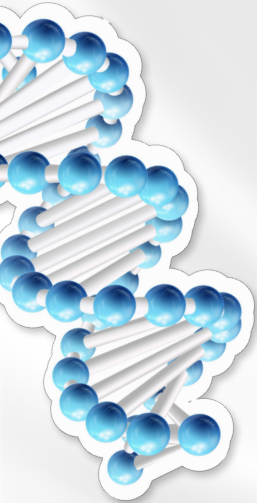
Discussion cont.

Macdonald, Sertorio

- As temperatures are rising, “the rabbit population now has a much higher level of genetic resistance” to diseases.

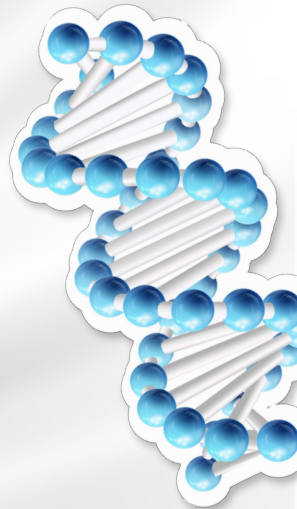
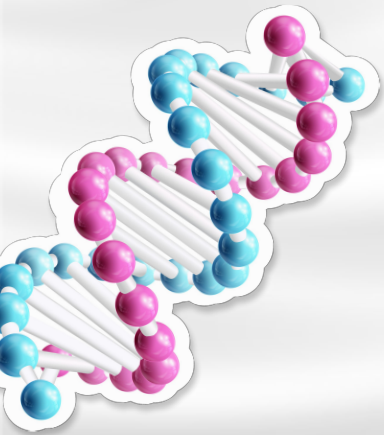
Hackländer, Ferrand, Alves

- Climatic and weather conditions have a strong impact on the abundance and the population densities of rabbits”
- Temperature conditions of the previous winter and the amount of precipitation in the summer
- European rabbits shift their breeding season in response to the harsh winters.



CONCLUSION

- Inquiry: whether climate affects the bunny population
- Hypothesis: sudden changes in climate would kill out the bunnies if there was no fur mutations
- Used 4 scenarios with climate as an independent variable
- Other environmental factors were added but were kept consistent
 - Wolves being added in the fifth generation
- Best survival chance: Tundra - Desert



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- Global Climate and Ecosystem Change. (1990). Netherlands: Springer.
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- Lenormand, T. “Gene Flow and the Limits to Natural Selection.” *Trends in Ecology & Evolution*, vol. 17, no. 4, 2002, pp. 183–189., [https://doi.org/10.1016/s0169-5347\(02\)02497-7](https://doi.org/10.1016/s0169-5347(02)02497-7).