Shy Studente

COMM 110

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Reversing Extinction

Topic: Deextinction

Specific Purpose: To inform my audience about the process of recreating extinct species.

Thesis Statement: Successfully reviving an extinct species includes three steps: genome comparison, genetic engineering, and restoration.

Introduction

Attention Material: As college students, most of us will probably live another 60 years or more. It's fascinating to consider the scientific advances we'll see over the rest of our lives. One thing we can look forward to is the area of deextinction, the process of recreating an extinct animal.

Credibility Material: I became interested in deextinction about four years ago, when National Geographic ran an issue on the topic. Around that time, I discovered Revive and Restore, the organization leading modern deextinction efforts. I've been following their progress and learning more about the stages of the process.

Thesis Statement: Successfully reviving an extinct species includes three steps: genome comparison, genetic engineering, and restoration.

Preview: Today, I'd like to briefly explain these steps. First, genetic research and comparisons are used to find mutations. Second, DNA editing is used to create living representatives of an extinct species. Third, the animals are released into the environment.

(**Transition**: Let's begin by examining the first part of the process, genome comparison.)

Body

I. Genome comparison is used to find important mutations in the extinct animal's DNA (About the Passenger Pigeon).

   A. Deextinction involves a close relative of the extinct animal, like the Asian elephant to the wooly mammoth. (Wooly Mammoth Project Update).

      1. These two animals have a common ancestor and are different through mutations, changes in DNA (Wooly Mammoth Project Update).
      2. The DNA of the relative may be changed to match the genome of the target species (Wooly Mammoth Project Update).

   B. The genomes of both species are sequenced and mapped (About the Passenger Pigeon).

      1. [Show first picture.] The DNA sequence is first written out and the genes identified (About the Passenger Pigeon).
      2. The genome of the extinct animal must be determined from multiple DNA fragments. (About the Passenger Pigeon). [This is represented by the red letters at the bottom of the slide.]
      3. The genomes are then mapped, or "lined up" with each other (About the Passenger Pigeon).

   C. [Show second slide.] Then, the genomes of both animals are compared side by side to find differences in mutations between them (About the Passenger Pigeon).

      1. Not every mutation is important to the deextinction process (Shultz). [Mute slide.]

2. In a *Science* magazine interview last year, deextinction ecologist Ben Novak claims the "actual differences" between elephant and mammoth genomes are in the thousands, but deextinction scientists focus on "the key 20 or 100 mutations which affect the traits that are most important" (Shultz).

(**Transition:** When the important mutations are known, the genes are altered in the second stage of the deextinction process. This step is the most exciting, as it creates living animals.)

II. Genetic engineering revives the species through hybrid DNA (Shultz).

A. This is the stage the passenger pigeon and mammoth projects are currently at (Progress to Date).

B. [Show third slide.] First, hybrid cells are created through DNA editing, which we'll look at as it applies to passenger pigeons (About the Passenger Pigeon).

1. Cells are taken from band-tailed pigeon embryos and cultured (About the Passenger Pigeon).
2. Using a new technique called CRISPR-Cas9, scientists "cut and paste" genes from passenger pigeon DNA into band-tailed pigeon DNA in these cultured cells (About the Passenger Pigeon).
3. This process creates a full set of hybridized genetic material matching passenger pigeon DNA

C. These hybrid cells are used to make a living animals (About the Passenger Pigeon). [Mute.]

1. The edited cells are injected into the embryos of rock pigeons acting as surrogate parents (About the Passenger Pigeon).
2. Because they have this hybrid DNA, some of the offspring from this second generation of rock pigeons will be passenger pigeons (About the Passenger Pigeon).

D. This step of the process is not the same thing as cloning (Quill).

1. Cloning uses cells from a living animal to make an exact genetic replica (Quill).
2. Deextinction involves combination of DNA from a living animal with parts of DNA from an extinct animal, creating a hybrid (Quill).

E. Stewart Brand, a lead scientist for Revive & Restore, notes on their website that because the DNA is hybridized and not cloned, it will never be an exact match to the original animal—selective breeding may be used to achieve some traits (Frequently Asked Questions).

(**Transition:** Successful completion of this step results in a group revived species in existence. So, what's the next step?)

III. The revived animals will eventually be released into the wild. (Shultz)

A. Deextinction scientists are not interested in creating a zoo exhibit—the goal is to have the animals live in in an environment similar to their former habitat (Shultz).

B. Revive & Restore plans to release passenger pigeons into their former habitat in the Eastern US, where they will play a key role in restoring forests (Progress So Far).

C. In Siberia, a nature preserve called "Pleistocene Park" has been designated the mammoths' future home (Anderson).

1. The creator of the park, ecologist Sergey Zimov, believes mammoths will change the landscape back to what it used to be around 10,000 years ago (Zimmer).
2. Pleistocene Park's current director claims that mammoths will help return the area to grasslands and slow permafrost thawing (Anderson).

D. The released animals should be able to benefit environment where released (Frequently Asked Questions).

(**Transition**: Today, we have considered the three main steps of the deextinction process, research, genetic engineering, and release.)

Conclusion

Summary Statement: As you have seen, the process of deextinction is complex. Each part of the process poses new difficulties. However, now that there is a clearer path forward, these goals have become much more realistic.

Concluding Remarks: There is still a good deal of skepticism surrounding deextinction, partly because it is misunderstood. Through understanding the process, we are better able to see that deextinction is a real possibility. I hope you are all looking forward to the future of deextinction, and perhaps someday sharing your lives with wooly mammoths.

Works Cited

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