Braxton Hawkins
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Old Dominion University/BIOL294-Genetics/Rinehart-Kim/Romanov Project

Internet Resources

You may use other Internet sources here, but please cite any sources that you use unless they are one of the following.

http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0004838 (You should be able to access the entire article. You may need to copy and paste the site address.)

http://www.ncbi.nlm.nih.gov/pubmed/20557352 (You won't be able to access the entire article, but the abstract will give you important information.)

http://www.nature.com.proxy.lib.odu.edu/ng/journal/v9/n1/pdf/ng0195-9.pdf (Please note that this is a PDF of an article.)

History

1. Nicholas II was the last czar to hold power in Russia. How long had the Romanov family been in power in Russia?

Answer: The Romanovs ruled for 300 years.

2. Nicholas II abdicated the throne. Who took power then?

Answer: His brother Grand Duke Michael Alexandrovich.

3. Describe what happened to Nicholas II and his family after he abdicated the throne?

Answer: His family were imprisoned by the Russian Provisional Government and exiled to Siberia

4. One of the reasons that the family of Nicholas II was executed (vs. just imprisoned) was because there was a fear that the White Russian Army would save them. Who was the White Russian Army?

Answer: They were a confederation of anti-communist forces that fought against the communist Bolsheviks known as the reds during the Russian Civil War

Hemophilia

One of the pedigree charts found at the end of this assignment comes from the Module powerpoint lecture notes.

5. How was Alix, the wife of Nicholas II, related to Queen Victoria of England? (Look at the pedigree chart very carefully.)

Answer: Alix was the granddaughter of Queen Victoria

6. On what chromosome is the gene that, when mutated, causes hemophilia, and how does this contribute to its inheritance pattern? Both Queen Victoria and Alix are designated as being carriers for hemophilia.

Answer: The X chromosome is the gene that contributes to hemophilia.

7. What does it mean to be a carrier for a disease?

Answer:A carrier for a disease means that an individual is capable of passing on a genetic mutation associated with a disease and may or may not display disease symptoms.

8. Why aren't males considered *carriers* for hemophilia?

Answer: Males are not considered carriers because hemophilia is an X-linked recessive gene. Males only receive one x chromosome.

9. In a couple of sentences, describe the physiology of the disease hemophilia. (Yes, I know it is severe bleeding because the blood cannot clot. But WHY can't the blood clot? Be *very* specific.)
Answer: Hemophilia is a disease that affects the blood. It's caused by low levels of "clotting factors" within the blood. Without the clotting factors the body would bleed severely even from minor injuries. There are 13 types of clotting factors, which work together with platelets in the "coagulation cascade" to help blood clot. People with hemophilia have lower levels which makes it harder for the blood to coagulate and plug the wound.

10. What type of hemophilia (A or B) is (probably) represented in the pedigree chart?
Answer: Hemophilia B is represented in the pedigree chart.

11. Describe the mutation (at the molecular level) that apparently caused hemophilia in Alix, (and probably all of the European families that had hemophilia). Be *very* specific.
Answer: The mutation was a substitution mutation on exon 4, gene F9 gene. This mutation is a nitrogenous base substitution that occurs and causes an amino acid sequence change.

12. How could the mutation you described in #11 result in a faulty gene product? Be *very* specific in your description.
Answer:

13. The Romanov's son, Alexis, had hemophilia. Describe how Alexis genetically acquired hemophilia. (Use a Punnett square. You can either draw a table or line up the genotypes.)
Answer: Alexis inherited hemophilia because his mother was a carrier and it was passes down to him.

	X^H	Y
X^H	X^HX^H	X^HY
X^h	X^HX^h	X^hY

14. Using a Punnett square (again, draw a table or line up the genotypes), explain why only males in the pedigree chart have hemophilia. (Choose at least one of the males represented in the pedigree chart, and show his parents in the Punnett square.)
Answer: Only males tend to have hemophilia because it is an x-linked recessive gene and if the mother is a carrier then the chances that she will pass it to her son is high, since he only needs one x linked recessive gene.

	X^H	Y
X^H	$X^H X^H$	X^HY
X^h	$X^H X^h$	X^hY

15. Is it possible for a female to inherit hemophilia, and, if so, how?
Answer: It is possible, females can inherit hemophilia but mainly as carriers. If a female inherits hemophilia alleles from both of her parents or if she inherits one hemophilia allele and her other X chromosomes are missing or does not work properly.

16. Some historians speculate that Alexis' hemophilia condition could have led to the Russian Revolution. Explain. ***You should look up the faith healer Rasputin and read about his relationship to the Romanov family.***
Answer: Rasputin claimed to be a healer of Alexandria's son. Rasputin used his status along with connections to influence a lot of governmental affairs, which was mainly used for his own self-interests. This could have made the public weary and question those who were in power. This could have started the Russian revolution.

Molecular Analysis of People in a Mass Grave

17. Two "graves" were discovered near Yekaterinburg, Russia. When were these graves discovered, and how many bodies were found in each grave?
Answer: The large graves weren't discovered until 1991 while the smaller graves were discovered in 2007. There were a total of eleven skeletons found, nine in the large grave and two in the smaller grave.

18. What type of testing was done to confirm sex and familial relationships among the remains found in the mass grave? If you use an abbreviation, write it out and define what it is.
Answer: Nuclear DNA testing of STR, markers was used to confirm the sex of the people in the grave as well as to determine the familial relationship among the individuals found in the graves.
Short Tandem Repeat (STR) is a microsatellite, or a sequence of two or thirteen nucleotides that are repeated hundreds of times on a DNA strand.

19. HRH Prince Philip, the Duke of Edinburgh, provided mitochondrial DNA used to identify Alix and her three daughters. HRH Prince Philip, the Duke of Edinburgh, is married to Queen Elizabeth II of England. Wait, isn't Queen Elizabeth II related to Queen Victoria? So why was ***Prince Philip's*** mitochondrial DNA used? (To help you answer this question, look at the second pedigree chart.)
Answer: Prince Philip Mitochondrial DNA was used because he happened to be the only living relative.

20. Who was missing from the mass grave (the one with the most skeletons)?
Answer: Tsarevich Alexi and one of his sisters were missing from the mass-grave.

Molecular Analysis of People in a Mass Grave, cont.

21. The Duke of Fife and Princess Xenia provided mitochondrial DNA used to identify Nicholas. One of these is a female and another is a male. Does that matter? What general statement can you make about their genetic relationship to Nicholas and Alexandra?
Answer: Yes it would matter if Nicholas' parents were trying to be identified. A general statement that can be made would be that Nicholas and Alexandra have the same mitochondrial DNA.

22. What was discovered in the mitochondrial DNA of Nicholas that was not identified in either the Duke of Fife or Princess Xenia?
Answer: The single point of heteroplasmy at the point 16169 was different in ration when it was compared with his brother, who had more T than C.

23. What is the term given to the existence of two (or more) genetically different mitochondria in the cell?
Answer: Heteroplasmy is the term given.

24. What three types of DNA were used to test the remains found in a second grave? Again, if you use an abbreviation, write it out and define what it is.
Answer: The three types of DNA used was: Nuclear (STR), Mitochondrial DNA, and Ancient DNA.

25. Of the three types of DNA you listed in the previous answer, which one would have been used specifically to identify Alexis and why?

Answer: Mitochondrial DNA would have been used to identify Alexis.

26. Was Anastasia in the grave in which Alexis was found?
Answer: It is uncertain whether it was Anastasia or Maria who was in the grave with Alexis, but both did not survive the execution.

Who Wants to Be Anastasia?
Apparently, about 200 people have wanted to be Anastasia and have claimed to be her! One of the most famous imposters was a woman named Anna Anderson (Manahan).
27. Give a brief history (2-3 sentences) of Anna Anderson-both her claims and what is thought to be true.
Answer: Anna Anderson claimed to be the missing princess Anastasia. She was originally from Poland but moved and settled in the United States. It was thought to be that she had been lying or that she had been Francis Schanzkowska

28. Where in the US did Anna Anderson eventually settle and why?
Answer: Anna Anderson eventually settled down in Charlottesville, VA.

29. What were the sources of Anna Andersons's nuclear DNA?
Answer: The source was tissues of Anna Anderson's intestine that were removed during her surgical operation.

30. What were the sources of Nicholas' and Alix's nuclear DNA?
Answer: The source of Nicholas' and Alix's nuclear DNA was bone/skeletal samples found in the grave.

31. What type of analysis was done on DNA from Anna Anderson, Nicholas, and Alix?
Answer: DNA/ genetic analysis were performed on the three individual's DNA.

32. Anna Anderson's mitochondrial DNA was compared to the mitochondrial DNA of what two "other" people?
Answer: Anderson's mitochondrial DNA was compared to the mitochondrial DNA of the Romanovs and Karl Maucher.

33. A hypervariable region of the mitochondrial DNA was analyzed. Define a hypervariable region.
Answer: A hypervariable region is a location within a nuclear DNA where the base pairs of nucleotides are repeating or having substitutions.

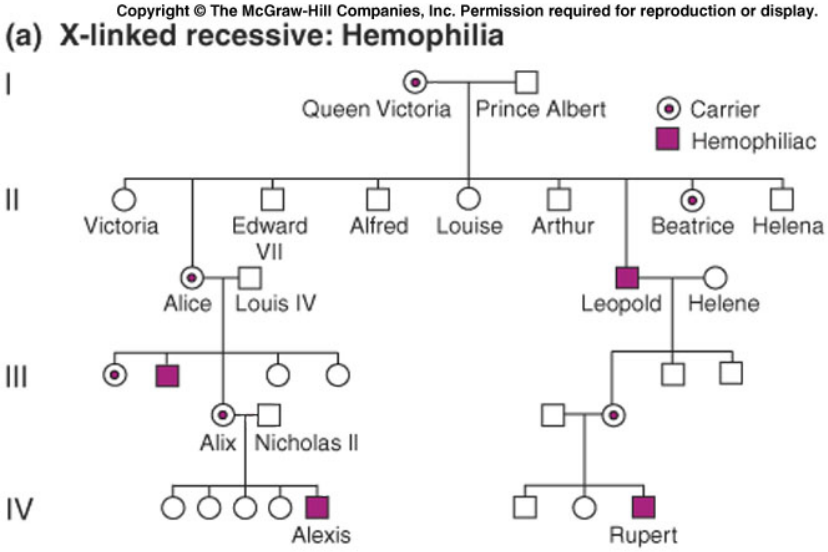
34. What were the conclusions from the mitochondrial DNA comparisons?
Answer: The DNA that was compared to the Romanovs and their relatives was found to not match that of the Duke of Edinburgh or of the bones. This confirmed that Anna Anderson was not related to the Romanovs. The DNA did however match with Karl Maucher showing that they were related.

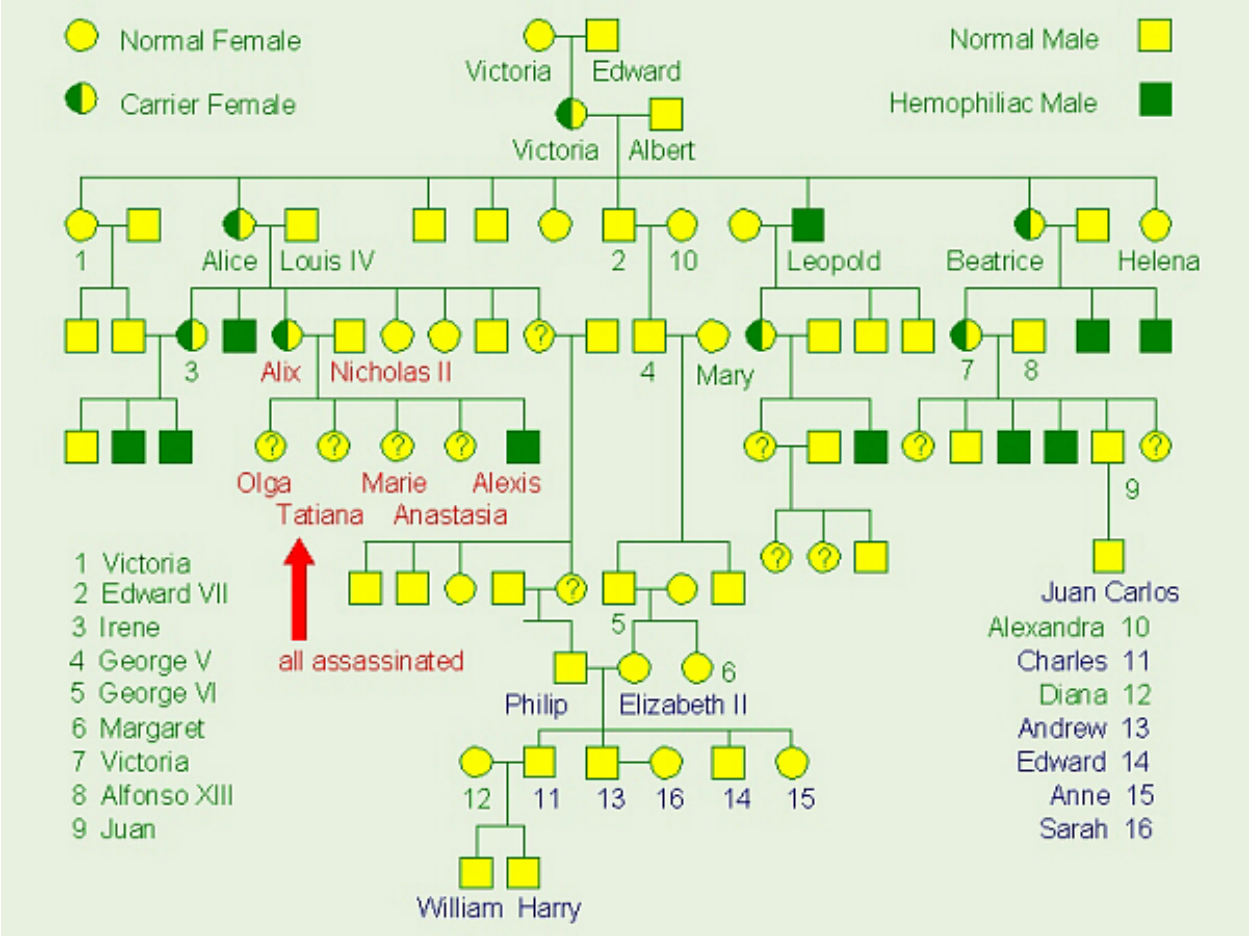
35. The article which describes the analysis of Anna Anderson's DNA was published in 1995. When were all of Nicholas' and Alix's children finally accounted for?
Answer: Nicholas' and Alix'S children were all finally accounted for in 2007.

36. What was the most surprising thing that you learned from doing this assignment?
Answer: The most surprising thing that i learned from duing this assignment was that

Are you still interested in the life of the last Tsar of Russia and his relationship to British royalty? The headline for the following article showed up on my Internet browser earlier this year. While I can't vouch for it as it did not appear in a peer-reviewed journal, it might be interesting reading for you.

https://www.townandcountrymag.com/society/tradition/a31028924/windsors-romanovs-relationship-last-gathering-true-story/





Source for the pedigree chart above: Janet Stein Carter, Biology Instructor at Clermont College, University of Cincinnati