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Professor Rinehart-Kim
Romanov Assignment Part B
April 7, 2023

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Part II

1. Using your knowledge from Module 4, on what chromosome is the gene that causes hemophilia? **The gene that causes hemophilia is located on the X chromosome.**
2. Describe the mutation that apparently caused hemophilia in Alix, (and probably all of the European families that had hemophilia). **According to the article posted by pubmed.ncbi.nlm.nih.gov, in the F9 gene, found in Alix's genes, there was a "substitution in the splice acceptor site of exon 4." (Lannoy, 2010)**
3. Using your knowledge from Module 7, describe how the mutation you described in #10 could result in a faulty gene product. **The gene product was ultimately altered because of the mutation that occurred in the gene. There is a type of missense mutation called nonconservative substitution. For context, a missense mutation means that a codon is changed into a mutant codon. During nonconservative substitution, an amino acid is substituted with one that has completely different features. As a result, the overall product of the gene can be altered.**
4. Again, using your knowledge from Module 4, give the genotype for a carrier of hemophilia. **The genotype for a carrier of hemophilia would be X^hX.**

Part III

5. Mitochondrial DNA testing was also done on both Nicholas II and Alix. Why was information from Alix's but not Nicholas', mitochondrial DNA used to identify three females as belonging to Alix? **According to journals.plos.prg, the mtDNA results for the three females, matched that of Alix's mtDNA, meaning that the three females were maternally related to Alix.**
6. HRH Prince Philip, the Duke of Edinburgh, provided mitochondrial DNA used to identify Alix and her three daughters. Why was his mitochondrial DNA used? Who was the HRH Prince Philip, the Duke of Edinburgh in today's world? Do you ever hear of his grandchildren (in magazines while you are waiting to check out of a store)? **The mtDNA testing conducted by researchers confirmed the genetic maternal relationship between HRH Prince Philip, the Duke of Edinburgh, and Alix and her three daughters. The HRH Prince Philip, the Duke of Edinburgh, was the longest reigning prince alongside his wife, Queen Elizabeth, who held the longest reign over the UK. The family of Prince Philip and Queen Elizabeth are all very well known, and they appear on many magazines and newspapers.**
7. Who was missing from the mass grave? **One of the daughters was missing from the mass grave- it has been debated on whether this missing daughter is Maria or Anastasia (the Russian forensic anthropologists believe it is Maria, while the US believe it is Anastasia).**
8. 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. **The only significance of one of them being a male and one of them being a female is that**

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females carry XX genotypes, while males carry XY genotypes. Ultimately, it was determined that both the Duke of Fife and Princess Xenia were maternally related to Tsar Nicholas.

9. What was discovered in the mitochondrial DNA of Nicholas that was not identified in either the Duke of Fife or Princess Xenia? **In Tsar Nicholas' mtDNA, a "single point heteroplasmy" at point 16169 C/T=Ywas found, whereas the Duke of Fife and Princess Xenia did not have heteroplasmy, but only 16169T. (Coble, 2009)**
10. What is the term given to the existence of two (or more) genetically different mitochondria in the cell? **Heteroplasmy.**

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Cited Sources

Lannoy, N., Hermans, C. The 'royal disease'—haemophilia A or B? A haematological mystery is finally solved. *National Library of Medicine.* **16**(6). https://pubmed.ncbi.nlm.nih.gov/20557352/ (2010).

Coble, M., et al. Mystery solved: the identification of the two missing Romanov children using DNA analysis. *PLOS One.* https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0004838#pone.0004838-Ivanov1 (2009).