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

You may use various Internet sources to answer any of the questions, but please cite any sources that you use if they are not ones that I suggest.

Part I: History

You may use various Internet sources here, but please cite any sources that you use. You will be using the following source for another section in this assignment, but it might help you answer some of the questions in this section. If you use this source to answer the following questions, you do not need to cite it. [*http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0004*](http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0004)*838 (You should be able to access the entire article.* ***You may need to copy and paste the site address****.)*

1. Who were the Romanov’s (in Russian history)? The Romanovs were the last family to rule the imperial dynasty in Russia .

2. *Briefly* outline the Romanov lineage. It was the Romanov family that ruled Russia for the last time as an imperial dynasty. Peter the Great, Catherine the Great, Alexander I, and Nicholas II were among the Romanov kings who took the Russian throne over the next three centuries.

History.com Editors. (2023, January 11). Romanov Family. HISTORY. <https://www.history.com/topics/european-history/romanov-family>

3. Nicholas II was the last Romanov to hold power in Russia. What was his title? Nicholas was the last Czar of Russia

4. What happened to Nicholas II? Why (from a geopolitical view)? Who then took control? Due to the Russo-Japanese war there was an uprising of Russian Workers, he was widely seen as a politically weak, indecisive leader. As a result the monarchy was abolished.

5. Describe the family of Nicholas II. What happened to them? Czar Nicholas II married Princess Alexandra of Hesse, a duchy in the German Empire in 1894, shortly after his coronation. Nicholas and Alexandra had four daughters- Olga, Tatiana, Maria, and Anastasia and one son, Alexei. Yekaterinburg Soviet forces feared Nicholas might be rescued in July 1918 as counterrevolutionary forces advanced. The imperial family was sentenced to death after a secret meeting, and Nicholas, his wife, their children, and several servants were gunned down on July 16.

Part II: Hemophilia

The pedigree chart below comes from the Module powerpoint lecture notes.

6. How was Nicholas II wife, Alix, related to Queen Victoria of England? Alexandra Feodorovna was the granddaughter of Queen Victoria.

Both Queen Victoria and Alix are designated as being carriers for hemophilia.

7. In a couple of sentences, describe the disease hemophilia. In hemophilia, the blood fails to clot properly due to an inherited bleeding disorder. The result can be spontaneous bleeding or bleeding after an injury or surgery. It is possible to stop bleeding with the help of many proteins found in blood called clotting factors.

What is Hemophilia? | CDC. (2020, May 12). Centers for Disease Control and Prevention. <https://www.cdc.gov/ncbddd/hemophilia/facts.html>

Use the following source for the questions 8 & 10: [*http://www.ncbi.nlm.nih.gov/pubmed/20557352*](http://www.ncbi.nlm.nih.gov/pubmed/20557352) *(You won’t be able to access the entire article, but the abstract will give you the information you need to answer the questions.)*

8. What type of hemophilia (A or B) is (probably) represented in the pedigree chart? Most likely, Queen Victoria was a carrier of Hemophilia B, which is why Alix , her granddaughter, and Alexis , Alix's son, are carriers.

9. 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.) As a result of his mother being a carrier, Alexis inherited hemophilia.

|  |  |  |
| --- | --- | --- |
|  | X^H | Y |
| X^H | X^HX^H | X^HY |
| X^h | X^hX^H | X^hY |

10. Using a Punnett square (again, draw a table or line up the genotypes), explain why only males in the pedigree chart have hemophilia. Romanov (XY) wife (Xx)

|  |  |  |
| --- | --- | --- |
|  | X | Y |
| X | XX | XY |
| x | Xx | xY |

From the Punnett square above that, only males are affected by haemophila. The female gender is not affected, but they may be carriers. Haemophilia gene is carried by X chromosome. Consequently, even if one of the haemophila genes is present in males, they will be affected. Females have two X chromosomes. It is therefore only if both X chromosomes are affected that they will be affected. Carrier genes are those that carry a gene for harmophilia on an X chromosome.

11. Is it possible for a female to inherit hemophilia, and, if so, how? Due to the recessive nature of hemophilia, a X carrying the gene from both parents is required. In this case, the affected female would inherit a homozygous recessive genotype, creating her hemophilia phenotype.

12. None of Alexis’ sisters are shown to have hemophilia. Using only the tools available at the time they lived, how could it have been determined whether they were carriers like their mother. As haemophilia is an X linked gene and mothers only pass X chromosomes to their sons, if their sons are affected by haemophilia, that means they were carriers. Through pedigree analysis, genotypes can be calculated and their ancestry can be analysed.

13. Using a Punnett square (again, draw a table or line up the genotypes), what is the probability the daughter of a mother who is a carrier and a father who does not have the disease, will be a carrier?

Female (XcX) male (XY)

|  |  |  |
| --- | --- | --- |
|  | X | Y |
| Xc | XcX | XcY |
| X | XX | XY |

The chances are that 50% of the daughters will be carriers and 50% will be normal.

14. Using a Punnett square (again, draw a table or line up the genotypes), what is the probability that 4 daughters of a mother who is a carrier and a father who does not have the disease, will be a carrier? X  Dominant X r  Recessive XX noncarrier female 25 % XY nonhemophiliac male 25 % XX r carrier female 25 % X r Y Hemophiliac Male 25 % Since the probability of a child being a female carrier is 25 % , then the probability of them having four daughters all being carriers would be 1/4 \* 1/4 \* 1/4 \* 1/4 = 1/256 or 0.39 % .

15. Using a Punnett square (again, draw a table or line up the genotypes), explain why none of Alexi’s sisters had hemophilia.

|  |  |  |
| --- | --- | --- |
|  | X | Y |
| X | XX | XY |
| xr | Xxr | xrY |

If the sisters were homozygous dominant, they would neither have carried the disease nor been afflicted by it. However, if they were heterozygous dominant, both would have been carriers.

16. Some historians speculate that Alexis’ hemophilia condition could have led to the Russian Revolution. Explain. You probably want to look up the faith healer Rasputin.

To heal his son, Tsar Nicolas II turned to the faith healer Rasputin. There is some evidence that Rasputin used his connections with the royal family in order to benefit himself. A result of this may have been the Russian revolution, which made people question those in power.

