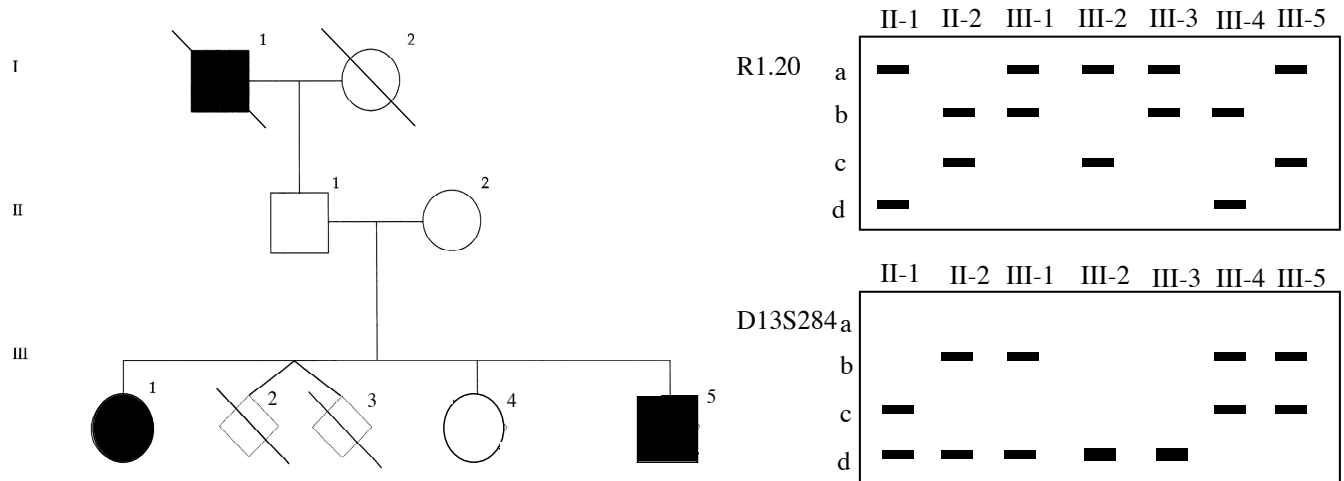


1. Retinoblastoma is a malignant tumor of the developing retina that usually occurs in children. Below is a pedigree of a family with retinoblastoma and gels with the results of PCR amplifications from two microsatellite markers located on the same chromosome as the retinoblastoma gene (RB1). The grandfather I-1 had retinoblastoma and consequently had to have one eye removed and was treated with radiation. The grandfather I-1 and grandmother I-2 died before genetic samples could be taken. Note some members of this family could carry a mutation in the retinoblastoma gene (RB 1) but still not get retinoblastoma. Also individual III-4 is old enough to have developed the disease.



Which marker(s) is/are linked to the mutation in the retinoblastoma gene?

- R1.20
- D13284
- Both markers
- Neither maker

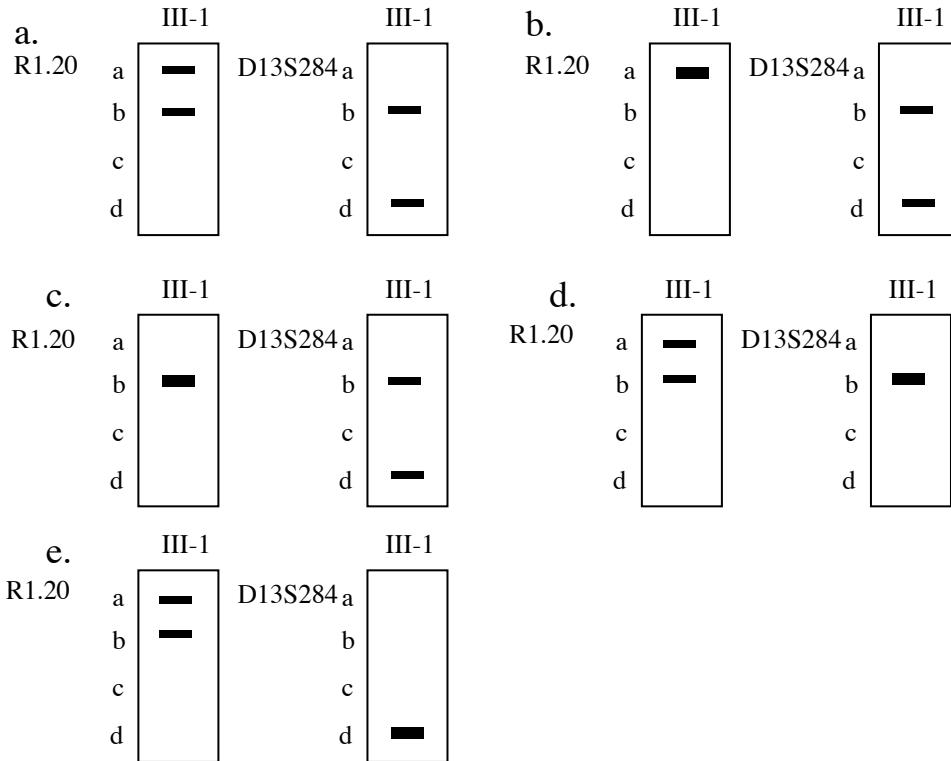
2. Which person in the pedigree is a carrier for a mutation in the retinoblastoma gene but did not get the disease?

- I-2
- II-1
- II-2
- III-4

3. Twins II-2 and II-3 died during the pregnancy. Were they at risk for developing retinoblastoma?

- Both twins were at risk for developing retinoblastoma
- Twin II-2 was at risk for developing retinoblastoma but twin II-3 was not
- Twin II-3 was at risk for developing retinoblastoma but twin II-2 was not
- Neither twin was at risk for developing retinoblastoma

4. Retinoblastoma in individual III-1 was caused by a loss-of-heterozygosity in a tumor suppressor gene. If a biopsy were taken of retinoblastoma tumor in individual III-1, what would the PCR products of the microsatellite markers most likely look like:



5. A woman was a heavy smoker for many years. As a result of her smoking habit, she developed lung cancer that does not spread to other portions of the body. The lung cancer was caused by a spontaneous mutation, which was induced by a carcinogen in cigarette smoke. This woman marries a man who does not have lung cancer. If this man and woman have children, which of the following statements is correct?

- The woman will pass the mutation onto her children
- If the mutation is dominant, the woman will pass the mutation onto approximately 50% of her children
- If the mutation is recessive, the woman will pass the mutation onto approximately 25% of her children
- The woman will not pass the mutation onto her children

6. You are interested in whether mutations in a specific gene cause a predisposition to lung cancer. What kind of family should you study?

- A family where many members smoke and get lung cancer at a young age
- A family where no one smokes, but members of the family get lung cancer at a young age
- A family where many members smoke and get lung cancer at an advanced age
- A family where no one smokes, but members of the family get lung cancer at an advanced age

7. If the gene you are studying in question 6 does cause an inherited predisposition to lung cancer. You would suspect that it is:

- a tumor suppressor gene
- an oncogene
- a proto-oncogene
- answers a-c are all equally likely without additional information

8. In the previous problem set, you learned that opossum gene #1 is functionally similar to yeast *CDC28*. You determine the DNA sequences for both genes, and the predicted mRNA sequences and amino acid protein sequences. Which will likely show the *greatest* sequence similarity?

- a. The DNA nucleotide sequences of the two genes will be the most similar
- b. The mRNA nucleotide sequences produced by the two genes will be the most similar
- c. The amino acid sequences of the proteins encoded by the two genes will be the most similar
- d. There is not enough information to answer this question

9. Mutations in the breast cancer gene (BRCA1) increase the risk of breast cancer for women. The BRCA1 gene is:

- a) found in all humans.
- b) a mutant allele of a gene found in all humans.
- c) a gene found only in women.
- d) a gene found only in women with breast cancer.

10. A recent study used a microarray to compare gene expression between individuals with and without sickle cell anemia. This study found that genes involved in the human inflammatory response are up regulated in sickle-cell individuals. These results suggest that:

- a) sickle cell anemia is caused by mutations in several different genes
- b) these inflammatory genes may be good therapeutic targets for treating symptoms of sickle cell anemia
- c) people suspected of having sickle cell anemia can be diagnosed by only examining the expression patterns of the inflammatory response genes
- d) all of the above